MAKING PLANNING RELEVANT:
THE REAL ROLE OF CORPORATE FINANCE REENGINEERING

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Much has been written about "reengineering" the finance function, yet the most common application has been cost-cutting. This ignores the original calling of reengineering—reformulating business processes to achieve competitive advantage.

The reason cost-cutting practices prevail is that many finance functions, including strategic planning, are so reactive as to contribute little to shareholder value. The real objective of corporate finance reengineering should be to restore relevance to the planning function by improving management's ability to measure and manage uncertainty, plus its ability to plan for contingencies.

Simulation-based planning models have been used at several companies to test growth opportunities against uncertain competitor behavior, improving the odds of costly wagers. In addition, the models have helped finance professionals assume previously unheard-of frontline responsibilities—anticipating, rather than reacting to, changing business conditions. Finally, they have been used to make objective, performance-based incentives attainable, by (1) allowing fair comparison of how difficult milestones are to achieve, and (2) distinguishing management's discretionary contributions to share value from the often overshadowing role of the economy.

PART ONE: THE PLANNING MYTH

The purpose of business process reengineering is to reduce the complexity and duration of manufacturing processes, thereby improving productivity. Yet companies struggle when applying the mandate to finance because of the seeming diversity and "one-off" character of finance processes (treasury, IR, financial planning, MIS, budgeting, hedging, *etc.*), and because of the difficulty in assessing contributions to share value. Too often, the exercise becomes a euphemism for cost-cutting.

The euphemism is unfortunate, since it ignores the principal objective of reengineering—challenging established business practices to show competitive advantage. Far from focusing on cost-cutting, the objective of reengineering should be to redefine finance as *the* central player in developing and executing corporate strategy, by improving its flexibility, readiness, and relevance to line managers.

The idea isn't new. Reengineering's role in manufacturing and selling processes has long been expansive. The disciples (Wal-Mart, IBM Credit, Taco Bell) have been leaders in improving sales force effectiveness, identifying and exploiting core competencies, improving quality and consistency, and fulfilling franchise opportunities. There is no immediate connotation of downsizing—surely not in consumer services or manufacturing.

In addition, business reengineering is opportunistic—balancing tangibles like profit and market share against seeming intangibles like complexity. The guiding image is a blank sheet of paper—a "fresh" look at processes and objectives which have long been taken for granted.

Blank Page or Writer's Block?

The "blank page" image suffers when transferred to finance. For one, the finance function's products are poorly defined. Most people believe that the product of capital budgeting is a budget, the product of strategic planning is a

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plan, and the product of accounting is a financial statement. The budget, plan and financial statement are not themselves measures of value creation, so they are perceived as necessary evils in corporate reporting. The impression is that less is more, that reengineering's directive should be leaner production of similar reports.

I spoke last year at a Global Business Research conference on "Reengineering the Finance Function." Fully nine-tenths of the agenda was devoted to coping with or facilitating downsizing. There was only one section (ours) devoted to making finance processes more powerful or meaningful.

The problem is that the product and process are defined incorrectly. The process at issue is corporate governance, not financial reporting. The products are superior project selection, superior long-term planning, and superior communication between managers, employees and investors—not budgets, forward plans and financial statements. What differentiates these ideas from common conception is that they are fluid and adaptive. And they can be judged, ultimately, by whether procedural overhauls contribute to share value.

The real question for reengineers is not whether the same reports can be produced with fewer staff, but whether the same (or different) staff can make the planning and reporting processes facilitate better business decisions. It is here that the financial community has lost direction.

Reengineering Identifies and Eliminates Bottlenecks

To be sure, systems engineers have vastly improved the way data is assembled and presented, empowering managers to make better decisions faster. Management education has also made strides—to the point where financial principles like the cost of capital, discounted cash flow, and even EVA® are commonplace.[1] Both the IS and performance measurement initiatives eliminate perceived bottlenecks in reaching effective business decisions.

The Biggest Bottleneck is Uncertainty

Despite improvements in data delivery and interpretation, the biggest decision-making bottleneck remains—inability to comprehend and exploit business uncertainties. Most finance functions simply react to deviations in market conditions from plan. And most managers view this as normal. After all, their experience in navigating through murky waters is what made them managers in the first place. A popular phrase today is "thriving on chaos."

Still, the reactive mode of management makes "value-based planning" oxymoronic since most of management's plan is or will soon be inaccurate. For most finance staffs, this means standing by unhelpfully as experienced line managers negotiate the shoals. Rather than thriving on chaos, finance staff are enfeebled by chaos, since it renders them incapable of contributing meaningfully to "just-in-time" decision-making.

The irony of this informational bottleneck is that its impact is harshest on strategic planning—presumably the most forward-looking of finance functions. The oil industry during the 1980's serves as an example. At the beginning of the decade, experts predicted crude might reach $100 a barrel, and most oil companies tailored their capital outlays and growth strategies accordingly. With hindsight, it turned out that OPEC's policing powers were overestimated, and oil prices collapsed. By 1983 or 1984, the basis for most oil company growth strategies was glaringly outdated, yet full-bore drilling efforts continued. Optimistic pricing assumptions were so ingrained in planning models that it took a series of hostile offers, recapitalizations, and greenmail to jog the planning process. This, in an industry which was legendary for the talent and expertise of its finance and planning departments.

[1] EVA is a registered trademark of Stern Stewart & Co. The author was a partner of Stern Stewart & Co. before founding Finegan & Gressle, and contributed to developing EVA and its applications.

Strategic Planning Has Become Hopelessly Reactive

By its nature, strategic planning is value-adding only if it anticipates, rather than reacts to, future events. Yet most strategic plans are out-of-date the day they are authored. They are like playing chess with a script, in vain hope that competitors will memorize the same play-book. At best, they anticipate only a handful of responses to the same opening gambit, then follow one particular series of moves and countermoves to their "likely" conclusion. Actual behavior deviates from the plan in most instances.

Granted, there may be instances where strategic plans were developed through a deliberate, collaborative process of market research, industry reconnaissance and financial forecasting, and where the plans served as value-adding blueprints for conducting business. To borrow a phrase from McKinsey, the plan becomes management's "bond"—an all-or-nothing contract with the company's stockholders.

Sooner or later, the bond will be broken. The typical forward plan's usefulness depends critically on the constancy of competitors and the economy. Yet no company take such constancy for granted. General Electric, a great disciple of binding managers to their plan, foundered when it forced rigid planning assumptions on the intrinsically greater uncertainty of its acquired markets—investment banking and broadcasting. IBM, now-famous for its linear approach to planning, was blindsided by inability to comprehend—much less build contingencies for—the possibility of a PC explosion.

The fact is, *most* companies are in industries beset by structural change, intense exposure to factors beyond management's control, and fierce gamesmanship with competitors. This is certainly the case for telecommunications, electronics, transportation, natural resources, computers, aerospace, and healthcare. And it is increasingly the case for such staid industries as consumer products, financial services, and insurance.

Indeed, the most common observation about strategic planning is that it lacks real-world relevance. It does not matter that system enhancements let managers verify deviations from plan. It does not matter that managers versed the plan in a discounted cash flow or EVA framework. All the education, reporting systems and financial theory in the world seem irrelevant if managers must, by themselves, fend off shocks that the strategic plan failed to anticipate. The conventional forward plan, despite intensive bottoms-up formulation, is not helpful as a detailed guide for operations.

All That Remains are the Targets

I am not suggesting, as a consequence, that managers miss targets like ROE or net income. On the contrary, they usually come remarkably close. However, the steps line managers take to reach aggregate targets bear dim resemblance to the steps prescribed by the plan. Five months into the year, the plan's only relevance is its bottom line—a frustrating thought for the managers who diverted weeks of valuable time to sweating out the details.

Disenchantment with the sluggishness and inaccuracy of planning tools can lead to disenchantment with planning itself. The first result is tension—tension between operating managers who deal constantly with random events and corporate managers who, lacking the tools to cope with uncertainty, must evaluate their business on the basis of narrow tolerances around budget.

Financial Discipline or Make-Work?

To hear corporate managers tell it, the planning process imposes vital discipline on line managers by testing investment decisions against a battery of financial tests. For corporate officers, it is often their only connection to what is happening in the field. At the vast majority of companies, however, the drill rings hollow because it fails to anticipate abrupt and material changes in the business environment. The situation is exacerbated when companies rehabilitate their strategic plans on the fly, forcing managers to play a never-ending game of catch-up. The all-too-common impression is that strategic

planning is a ritual, a waste of management time.

I called recently on a former client in the plumbing, home furnishing and motors business. It was mid-April, and the company was still hammering out a matrix of individual functional responsibilities and targets for a thousand-or-so managers—with each responsibility and target designed to cohere to the company's current-year strategy. The problem was, the strategy was itself a product of months of pencil-pushing and negotiation, and was already dependent on GDP, homebuilding, exchange rate, and consumer spending assumptions which were starkly unrealistic. The planning process had thus transformed the company into a highly disciplined, highly polished brigade, marching into an empty battlefield while the war raged elsewhere.

The second result of disenchantment is dismemberment, frequently dubbed "reengineering." I encountered an extreme case of this at one of the airlines, where load factors ran 2-to-3 cents per passenger mile higher than its "no frills" competitors. The company not only scrapped its long-term planning process, it scrapped its *annual budget*, because, in the words of the chairman, the uncertainties besetting the company were "bigger than [the company] and bigger than the airline industry." In other words, the company was so buffeted by inconsistent pricing, erratic competitor behavior, government interference, and complex consumer practices that even its budget was useless as a guide to performance. Time seemed better directed toward putting out brush fires.

Of course, abandoning planning altogether makes a company completely reactive. With rare exceptions, the company will become a laggard in its industry. This appeared to be the case with the airline above, since it had the second highest cost structure in the industry, and showed little evidence of improving its ranking.

Blurring the Distinction Between Strategic and Financial Planning

Readers may object that I use the phrases "strategic planning," "financial planning," "value-based planning" and "capital budgeting" interchangeably. That is intentional.

To maintain command and control over large organizations, most companies departmentalize what should be complementary tasks. The typical "chart-of-accounts" method of planning, valuation and budgeting procedures makes them seem amenable to delegation and separation. The results are often perverse.

Separating "strategic planning" from "capital budgeting," "financial planning" or "value-based planning" breeds conflicting goals, assumptions, data sets and forecasts. It also gives rise to competing fiefdoms where information is hoarded and released selectively, forcing a bureaucracy to regulate its flow. Rather than partnering with line managers to create value, the planning and budgeting departments jockey for recognition by the corporate office, and forge an uneasy "command-and-control" alliance against line managers. Proactive planning is stifled. What's remarkable is that so many smaller companies emulate these larger companies—as if the bureaucracy contributed to their success. More often than not, the companies succeeded in spite of their bureaucracy. That's not my definition of an effective role model.

The reengineered financial management system consolidates the seemingly diverse tasks of financial management into a coordinated program of *business* planning and risk management. By unbinding the planning functions from static, inflexible point estimates, business planning can actually be elevated to a "process." Part II of this article describes the necessary steps.

The Planning Conundrum in a Nutshell

To recap, traditional planning tools are too sluggish and one-sided to adapt to the evolving needs of line managers. The result is that reengineering's principles have been invoked to de-staff planning, rather than develop new tools which make planning swift, "contingency-aware" and responsive. In addition, there has been little effort to pierce the communication barrier which conventional planning tools erect

between the corporate office and the field. Yet therein lies the true challenge of corporate finance reengineering: *making planning processes relevant to line managers who have come to accept just-in-time practices and chaos as the norm.*

PART TWO: THE PATH TO EMPOWERMENT

Drs. Hammer and Champy estimate that 50 to 70 percent of reengineering efforts fail.[2] In some instances, failure occurs because *tasks* were reinvented, not processes. In other instances, the authors cite internal resistance or weak leadership. Yet they overlook the biggest reason for failure: *misguided* reengineering.

A reengineering initiative is only as effective as the understanding of the economy, markets, and competitors which generated it. Reengineering experts imply that concentrated brainstorming to define and reinvent business processes will lead inevitably to better strategy. It won't. The world must be static enough, and competitors' behavior predictable enough, for brainstorming to yield surefire results. If management's window on the world is not real-time, or if competitors react differently than planned, the reinvented business process may fail miserably. It may even stifle creativity, by making pariahs of those who attempted to reform uncompetitive practices. For *business* process reengineering to succeed, companies must reengineer the *planning* process as well, by making it as contingency-aware and real-time as the business processes it is designed to assist.

I would venture further: what Drs. Hammer and Champy call resistance to change is usually not resistance at all, but distrust of the planning process' data sources, assumptions and means of coping with uncertainty. At most companies I call upon, corporate and line managers are keenly aware of the importance of creating shareholder value, and of the need for occasional bold reform. There are usually powerful incentives in place to drive management's attention toward improvement. What's lacking is respect for the competence of the planning process itself, not willingness to change. Unfortunately, disrespect for the planning process is justified at most companies, thus calling into question the relevance and viability of any strategic initiative—no matter how fundamental, radical or dramatic.

To be fair, Drs. Hammer and Champy state that technology is the "essential enabler," anticipating the possibility of enhanced data gathering and interpretation. But they verse their discussion in terms of *business* processes—not planning. There, they rely on traditional information sources and top-down brainstorming practices to plan the reengineering initiative. No wonder failure rates are so high.

Execution of a reengineering plan may be top-down. But the understanding of the business and its environment must be bottoms-up. A reengineered financial management system is the only assurance that proposed business strategies will enjoy vitality and responsiveness in an ever-changing world. Far from being an auditing and policing tool, the financial management system must empower managers to develop and execute corporate strategy—by assuring its flexibility, readiness and relevance to line managers. The transition requires new technology.

I am not suggesting that technology, by itself, is reengineering. For example, technology to conduct the same task faster is not reengineering. Technology which allows a dramatic transformation in the complexity, mission and choice of *business* processes may be. The same proposition holds for *planning* processes.

Classical Finance Underutilizes Technology

Most classical financial planning tools were developed in the 1960's and 1970's, when the power of mathematics outstripped the power of computing. "One-size-fits-all" formulas were

[2] M. Hammer and J. Champy, *Reengineering the Corporation* (Harper Business, New York 1993) at 200.

derived to explain *investor* behavior, stock prices and security risk. The formulas were, in turn, wedged into *corporate* formulations of performance measurement, valuation and financial planning—often at the expense of economic accuracy. The best these mathematical formulations could achieve were reasonable point estimates of expected value and returns, with few insights into dispersion or bias. Yet it is these latter insights which—in an uncertain world—spell the difference between relevant and irrelevant planning processes.

To address uncertainty, many companies hypothesize bounds to earnings, cash flow or EVA using statistical concepts like standard deviation. The statistics depend on the aggregate performance measures being stationary and normally distributed. Unfortunately, they are neither. Worse, truly discerning mathematical formulations like the binomial model for pricing options are incomprehensible to all but the most seasoned finance professionals. They thus breed misuse and skepticism among the corporate masses.

Textbook vs. Real-World Gambling?

Fortunately, companies need not rely on abstruse, poorly transformed security analysis models to evaluate corporate strategy. The power of contemporary desktops now outstrips the power of mathematics. Consider, for example, how you would assess the odds of drawing a flush at poker. If no cards had been dealt, you might consult a textbook. The example is likely to appear somewhere.

The math gets trickier if the game has already begun, and you're contemplating exchanging two cards to fill the flush. Trickier still if there's a wild card. Or if some of the opponents' cards are visible. Or if the number of opponents changes. Or if, instead of seeking the odds of drawing a flush, you'd simply like to know the best next move, in light of other possible combinations and other players' cards. The point is that the mathematical model is only helpful in *previewing* the odds associated with a specific hand, not in planning contingencies. That's a lot like classical financial planning.

The High-Stakes Game of Incentive Stock Options

Three years ago, I had the privilege of addressing the Financial Accounting Standards Board on the proposed charge to earnings for the value of newly issued stock options. The proposal never stood a chance—not because it was a bad idea, but because it was a good idea poorly executed. The proposed Black-Scholes option pricing "model" (really a formula) was a black box to most managers, including finance professionals.

Derived in the mid-1970's to value fully transferable short-term European calls on non-dividend-paying instruments, the formula was tweaked, squeezed and reshaped numerous times to conform to non-transferable long-term American warrants on dividend-paying instruments where exercise is contingent on employment and where the holder cannot be expected to behave like a liquid diversified investor.

If that sounds like a mouthful, it is. To date, no derivative of the Black-Scholes formula has attained consensus as a theoretically or empirically reliable measure of an employee stock option's value. Consequently, it is highly probable that two companies with different advisors would arrive at different valuations for their options. In fact, a major danger of employing a black box formula like Black-Scholes' to value management stock options—especially when lodging responsibility with non-financial experts like compensation consultants—is that companies would race to the bottom, seeking out compensation advisors who would back favorable assumptions like a higher-than expected dividend yield or a higher-than expected level of employee attrition.

Beyond that, the black box approach is counter-intuitive. Try explaining why the value of a manager's stock options rises when interest rates rise, despite a generally negative impact on stock price. Or why treasury managers should hedge

risk when their stock option pricing formula rewards volatility.

The option pricing proposal faced a bleak reception. It was nightmarishly opaque to managers who were to be charged, and too simplified for boards and even stockholders to assume satisfactory translation into a corporate context.

It's All in the Cards

If only someone had thought about cards. The easiest way to appreciate odds is to see them—by playing the cards out over and over, keeping track of how the hands cluster. It's not difficult to see how this could be accelerated by a computer. Or why using a computer is more comprehensible than textbook statistics. It's not that programming the simulation is easy. It isn't. It's that the inputs, outcomes and logic behind the simulation are clear to everyone, not just the statisticians. And managers can see how the simulation addresses the particular challenges of the question at hand. The opposite can be said of textbook statistics and classical economics. Textbook statistics and classical economics provide easily *calculated* answers, but they do not lend themselves to *understanding*. This is because the mathematical formulas for card-playing and option pricing defy easy derivation, and describe only one outcome—when managers and card players are more interested in the full range and dispersion of outcomes.

In the stock option example, a computer could have generated a 60- or 120-month forecast for a company's stock price, assuming certain growth, volatility and dividend characteristics, and then present-valued the amount by which the option was in the money upon expiration. If repeated several thousand times (a relatively easy task on desktop computers), the average valuation, excluding instances where the option ended out of the money, would have been an unbiased estimate of how much the option was worth. If conducted over short periods with no dividends, the results would have matched the Black-Scholes formula.

The beauty of the simulation technique is that it is graphically and intuitively clear to line managers how their options are valued. Focus can thus be diverted to parameters managers can comprehend—a stock's expected level of volatility, its expected growth rate given dividend policy and interest rates, and a manager's likelihood of leaving the company before vesting or expiration.

Rather than trusting outside advisors and "quants" to reformulate the already abstruse Black-Scholes formula, management can fine-tune the option-pricing experiment to control for almost every variable that makes Black-Scholes ponderous and inaccurate. And they can do so in a way line managers understand and respect. In the end, there will doubtless be debate over discount rates, attrition assumptions and the like, but the debate will be informed and will not depend on blind faith in incomprehensible and externally defined sets of formulas.

The distinction is between a black box where the formulas themselves are opaque, and a series of simulations where the simulations are crystal clear, but the programming to facilitate the simulations is not. The former requires a financial expert to comprehend the conclusions; the latter requires a modeling expert to make the conclusions comprehensible to all. The latter is the better way to devote financial resources, and the only way to make those resources relevant to line managers. It is also the only way to directly assess clustering and thus uncertainty.

Merck Has Made Project Selection a Science

A number of companies have re-examined the traditional tools of financial analysis—capital budgets, discounted cash flow and NPV—in light of microcomputing advances. The most respected proponent is Merck, which ten years ago replaced conventional "what if" analysis of capital requests with a more rigorous (and value-adding) series of simulations, or "Monte Carlo" experiments. Judy Lewent, Chief Financial Officer of Merck, championed the mainframe-based initiative, and has witnessed vast improvements in the way new drug initiatives are evaluated, refined and selected. The company's approach to project selection was showcased in *Harvard Busi-*

ness Review's January-February, 1994 issue.

Merck's legacy is superior project selection. Simulation-based modeling is the centerpiece of Merck's research and capital budgeting process, encouraging managers to think beyond the level of profit associated with a *successful* drug introduction, to the company's exposure in attempting to attain success.

Merck understands better than most companies that devoting attention to uncertainty can create more value at the margin than devoting financial resources to projecting, prescribing and policing "expected" returns. The latter set of activities is relevant only if it can adapt swiftly and proactively to changing economic, regulatory or scientific circumstances. Better identification and modeling of uncertainty makes such responsiveness possible.

Why Stop at Project Selection?

The logical extension of Merck's approach is strategic planning—but where strategic planning is redefined as: (1) an ongoing, just-in-time process of anticipating and responding to contingencies; (2) a risk-weighted process of identifying, prioritizing and executing business opportunities; and (3) a process which meaningfully shares and utilizes the superior experience and intuition of line managers. The three conditions are a far cry from planning exercises at most companies—yet that is precisely the point. The planning process itself must be redefined if it is to attain lasting relevance to line managers.

The Six Steps of Corporate Finance Reengineering

There are essentially six steps in corporate finance reengineering. Together, these steps furnish the means to make planning exercises relevant and responsive in a complex, changing business environment.

Step 1: Identify Important Building Blocks of the Business

The first step is to assign meaningful and, if possible, verifiable patterns to the value drivers of a business. This means identifying and ranking key value drivers, including sources of exposure.

The best source of information for this task is line management. The problem at most companies is not inexperience, but a wealth of experience inadequately shared. The first step in corporate finance reengineering thus is to make managers articulate for the benefit of other managers the reasoning processes they've gleaned from years of work in a focused area. The reengineered financial management system asks line managers to forecast value drivers in terms of ranges, with some articulation of what factors must converge for the high or low end of the spectrum to be attained. In addition, the reengineered financial management system focuses attention on the distribution of discrete value drivers, not aggregate performance measures like ROA, market share or EVA. Business aggregates are the result of too many variables for managers to describe distributions confidently or accurately. There is also no sound means of corroboration. A good simulation model determines aggregate distributions from how simulations cluster after allowing the model's components to vary randomly in accordance with understood patterns.

Make no mistake. Assigning bounds, relationships, and distributions to value drivers is not pure science. Only some variables (*e.g.*, receivables days on hand) can be assigned probabilities based on verifiable historical experience. And it would be unfortunate if management limited its focus to only what the company or industry historically had achieved.

That's why line participation is so important. Companies routinely rely on line managers to make judgment calls based on intuition and experience. The reengineered financial management system just asks managers to put the *reasoning* behind those judgment calls on paper—*in advance* of the actual contingency arising. Wherever possible, the reengineered financial management system asks managers to recall and articulate experiences they relied on in thinking through certain issues. The process provides

opportunity for interaction, for sharing thought processes, and, in many instances, testing manager's impressions.

Step 2: Build a Better Model

The second step in corporate finance reengineering is modeling. Modeling means abandoning the "chart-of-accounts" approach to financial planning. It means hypothesizing relationships between key value drivers, devising empirical or anecdotal tests of these relationships, and preparing the decision tree management foresees as it anticipates competitors' behavior and the economy.

To be sure, developing a comprehensive, contingency-laden model of a business is hard. It is the hardest step in finance reengineering. But it is also the only way to make planning exercises keep pace with change, and thus remain capable of long-term relevance.

Step 3: Play Lots of Hands

The third step in corporate finance reengineering is simple: run lots of simulations. This may not be easy to program. But once programmed, it is a matter of sitting around and watching. It is also easy for the line managers to comprehend. A business model which depends on many uncertain variables is recompiled over and over—allowing value drivers to vary randomly in accordance with tested or agreed-upon patterns. Management searches for clusters, knowing that narrower dispersions are safer bets than wide ones.

Step 4: Examine the Aggregates

Running lots of bottom-up simulations furnishes what no top-down analysis can—realistic estimates of how aggregate performance measures like sales growth, return on capital, EVA, and even share value creation are distributed. The problem at most companies is that these aggregate measures are the function of so many distinct, interacting variables—each with their own unique distribution—that it is impossible to rely accurately upon classical statistical markers like standard deviation or variance. More significantly, the variables change over time, so that the statistical markers have no lasting relevance.

The reengineered financial management system both simplifies and broadens management's understanding of how aggregate performance measures perform in the presence of uncertainty. Focus is directed toward how the simulations (or hands) cluster. Management can, for the first time, differentiate strategies which promise identical levels of EVA on average, but which have strikingly different levels of dispersion (and thus risk). Management can discern underlying asymmetries in how important performance measures cluster, and—again for the first time—assign meaningful odds to the so-called "best" and "worst" case. Last, management can gauge expectations in accordance with a particular strategy's difficulty of attainment. These forward-looking implications are the essence of the fifth step in corporate finance reengineering.

Step 5: Reevaluate Business Strategies

A probabilistic view of projected cash flows enables superior project selection. It also enables better strategy. There is surely no better tool for selecting between strategies than a financial planning model which accurately illustrates relevant tradeoffs and uncertainties. I will elaborate on this point in the case examples which follow.

Step 6: Plan Contingencies

The most distinctive aspect of the reengineered financial management system is that it is resilient—it has probative value long after the simulations are run. This contrasts starkly with the traditional planning process, where the budgeted income statement and balance sheet bear little resemblance to ensuing reality. Instead, all that the corporate office can count on is that line managers will attempt to fulfill *aggregate* objectives like earnings per share or EVA, with utter disregard for above-line detail. Conversely, all that line managers can count

on is that the previous year's planning exercise will prove useless during the year, except to assert aggregate targets.

The reengineered financial management system differentiates itself by providing continuous guidance in the face of change. It does so because almost all changes were, to some extent, contemplated by the model. The reengineered planning process thus adapts the "most likely" case to the context of actual business experience, and does so rapidly enough to provide line and staff managers with a basis for meaningful discussion of business options.

PART THREE: APPLICATIONS OF CORPORATE FINANCE REENGINEERING

The reengineered planning process has implications for all aspects of financial management. The most piquant to many managers may be executive incentive compensation, for the topic is rich in controversy and—because of imperfect classical financial tools—general misunderstanding.

The Real Dope on Incentive Compensation

Recent cover stories in *Fortune* and *Business Week* create the impression that promoting shareholder wealth boils down to selecting the right performance measure. Subscribe to balance sheet-sensitive measures like residual income, cash flow ROI, or, more recently, EVA, and you will—by changing measures alone—maximize prospects for your stockholders. Only if you are lucky. The problem is that value-planning experts have so muddled the public forums with their peculiar formulations of performance measurement that they have diverted attention from the more pressing practical considerations of implementation.

Stripped to its essentials, the debate over performance measures is a dead one. All recognized authorities agree that capital has an opportunity cost, and that this cost must be subtracted from income in assessing profitability. For the vast majority of companies, it is adequate to net the opportunity cost of equity from net income. Unfortunately, "the right measure" will not get you far. It might not even prove relevant.

1. Calibration

Ask any corporate insider what the most arbitrary (and unsettling) aspect of their pay-for-performance plan is and he or she will tell you, "How much pay for how much performance?" Not, "What kind of performance?" Not even, "What kind of pay?" These are subsidiary to the fact that no compensation expert has yet justified in proxy materials or other public materials how much of a company's value creation belongs to management. Or quantified how the percentage should differ from one division's plan to another's. Or shown why bonus payouts should increase linearly with achievement, when everyone knows that the second $1 million is harder to attain than the first. To date, there has been scant attention devoted to calibration—yet calibration is the check that prevents pay-for-performance plans from be-coming either (1) horribly unfair between divisions or (2) a picnic for managers.

2. Differentiation

Delve beyond calibration and managers will express another concern: the incentive plan compensates the economy's performance, not management's. Far from addressing the issue, many compensation experts revel in it, saying managers should bear the full brunt of economic vicissitudes, irrespective of management's contribution. We call this the "all in one boat" theory.

It's the wrong boat. If stockholders knew that managers were rewarded or penalized only for their distinctive (and discretionary) contribution to share value, they would invest long in companies sponsoring such performance measures and would short those without them. In so doing, they would hedge themselves against all

economic forces except management uncertainty. Now that would be a true alignment of stockholders' and managers' interests. And it should be a central implementation topic in any pay-for-performance de-bate—rather than continued debate over the measure.

3. Integration

Last, the compensation industry has yet to associate highly aggregated measures like residual income and EVA with specific tasks of managers. Consequently, there is no way to distinguish performance between management teams or functions beyond a highly aggregated group level, and no specific hands-on advice on how to improve individual bonuses.

The truth is, not all EVA is created equal. There are many ways for a company to generate the same long-term EVA, ROI and cash flow targets. Yet only one such path promises the greatest likelihood of turbo-charging a company's stock price. Some bonus-maximizing trajectories will actually damage stock price. The point is that distilling balance sheet measures into one specific formulation of performance will never, by itself, ensure coordinated management initiative to improve share value.

Why Conventional Compensation Measures Fail

The usual response to cyclicality is a deferral scheme—employing a series of overlapping long-term plans or a bonus bank. The hope is that if you wait long enough, the plan will smooth out economic cycles, and thus differentiate management's contribution to share value. Yet no manager would have waited out a 10 to 15-year deferral to cover the shake-out and reconstruction of the domestic and international airline industry. Some improvement might have come from indexing aggregate measures like EVA against competitors', but the index would have been fraught with inconsistencies over route exposure, unionization and product mix. Moreover, indexing would have been impossible at the cargo handling or information services level, because public surrogates are so few.

Nor would there have been guidance in running "what if" scenarios on identifiable sources of exposure. The typical "what if" experiment modifies one item (sales or working capital days-on-hand), and observes how it percolates through a sieve of well-defined relationships (COGS margin, corporate tax rate, *etc.*). "What ifs" are thus useful where the economy and competitors play by well-defined scripts or rules. For most industries, the players are more creative, and the environment more chaotic. Rather than modifying one item and holding everything else uniform, truly useful "what if" analysis holds only one premise constant (*e.g.*, sales or working capital), and allows all other factors and relationships to vary. Only then can line managers dissect task-specific value-adding strategies from the many possible means of improving a company's EVA.

Finally, some compensation experts calibrate award levels by publishing statistical summaries of industry-wide performance measures, and then incorporating "confidence intervals" into the plan's hurdles. What this boils down to is applying a uniform statistical measure like standard deviation to an intrinsically non-uniform, moving distribution like EVA. The prescription is not remedial. Measures like EVA are functions of so many diverse (often discontinuous) variables that they are seldom, if ever, distributed evenly, and they almost always have lop-sided tails. They are also moving targets. To date, there has been almost no attempt by compensation experts to measure and manage this uncertainty directly, yet it is imperative if compensation packages are to really "pay for performance."

What's Missing is Business Expertise

At the center of the implementation void is a chasm between compensation "expertise" and business know-how. Although performance measures and broad design features can be generic, many implementation tasks cannot. To make implementation work, the compensation expert needs a strong sense of the business circumstances attending a particular strategy. Only

then will he or she have:

- ☑ a sense of how difficult the hills are to climb;
- ☑ a sense of management's discretionary contribution to share value;
- ☑ a way to differentiate performance within business groups; and
- ☑ a way to relate aggregate performance measures to identifiable management tasks.

Until recently, there was simply no substitute for experience—hence, the nagging suspicion among line managers that shareholders would have been better served by traditional subjective practices.

My experience has been that plan design succeeds when it incorporates real-world uncertainty explicitly into the target-setting and calibration process. This is made possible when corporate managers develop probabilistic models, not individual forecasts, to describe their businesses. Such models modify performance targets to reflect changes in macroeconomic conditions beyond management's control—and do so in a manner which is widely understood and accepted in advance.

Such models also provide guidance as to the distribution of aggregate performance measures, since they can be run on a PC hundreds of times—allowing competitors' behavior and the economy to vary randomly, but in accordance with well-defined patterns. These distributions can be used to determine, for example, how steep management's hills are to climb, and thus how to calibrate an incentive plan.

In addition, the hundreds of simulations generated by a single probabilistic model will remind managers that there are many paths to the same EVA. A quick discounted cash flow comparison will reveal, however, that only one such path is value-maximizing. The database of simulations thus becomes a powerful practical guide for identifying which specific tasks and decisions of management are most consistent with increasing stock value—not just EVA.

Finally, the database of simulations shows how clustered value-enhancing patterns are, and thus each pattern's probability of attainment. It is quite possible, for example, for a value-maximizing strategy to be outweighed by a less ambitious, but far more probable, value-enhancing strategy. By quantifying uncertainty graphically, the reengineered financial management system empowers managers to at last tighten the association between value-adding strategy and compensation.

It's Not Just Compensation

Although piquant, incentive compensation is only the tip of the iceberg. Virtually all aspects of the finance function can be improved by three-dimensional modeling and decision-making. What follows are three case illustrations.

Case 1: Financing The Emerald City

Three years ago, we reevaluated the financing requirements and valuation of a proposed Wizard of Oz theme park in Kansas in light of uncertain attendance levels, construction delays and weather patterns. I say "reevaluated" because the investor group had already engaged an investment bank to prepare detailed cash flow forecasts. The investment bank also supplied "best case" and "worst case" scenarios, but provided no concrete way to test the "base" forecast's sensitivity to real-world uncertainty.

Instead, what the investment bank's "base case" did was define modal and perhaps average expectations. What it could not do was quantify confidence intervals around that mode or mean for purposes of quantifying and pricing needed financing. Moreover, the bank's "what if" scenarios created the illusion of stability in margins, cost structure, weather patterns, and other key variables when, in practice, each item varied significantly as other variables changed.

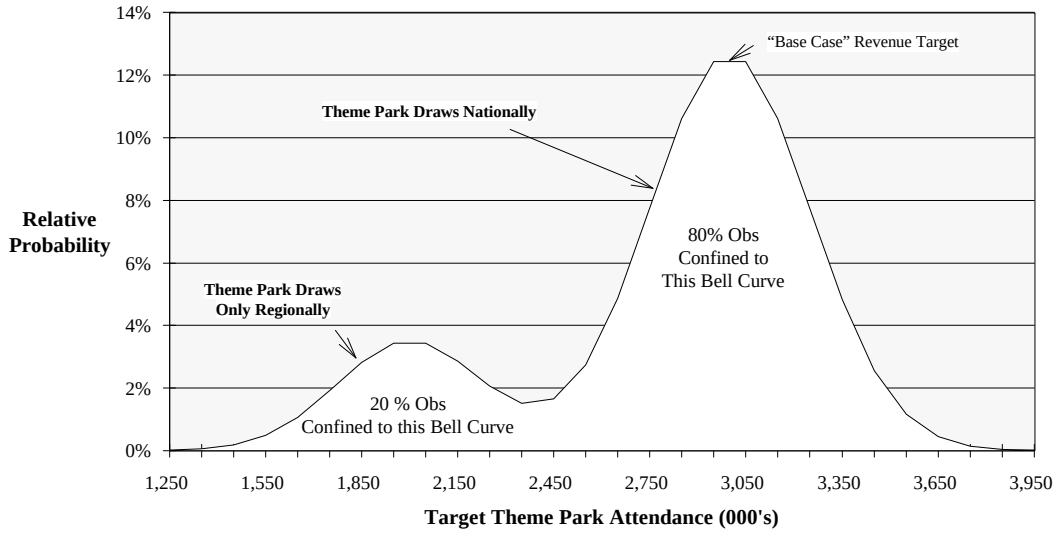
At a structural level, factors with multiple modes tended to be ignored (for example, the park could either succeed as a national resort or become strictly a "drive to" attraction, with two different clusters of attendance). Without a probabilistic model, the investment group was not likely to detect skewness in computing either its financing needs or its prospective investor returns. This might have resulted in a serious mis-

conception of the project's fair market value, and disappointment at the time the group sought refinancing.

To correct these deficiencies, we remodeled The Emerald City from the bottom up, so that it mimicked the investment bank's forecast when all key input variables were the same, but incorporated real-world randomness into those variables, and real-world randomness into structural relationships. Of these two types of revisions (randomness in input variables and randomness in structural relationships), the structural revisions proved more important.

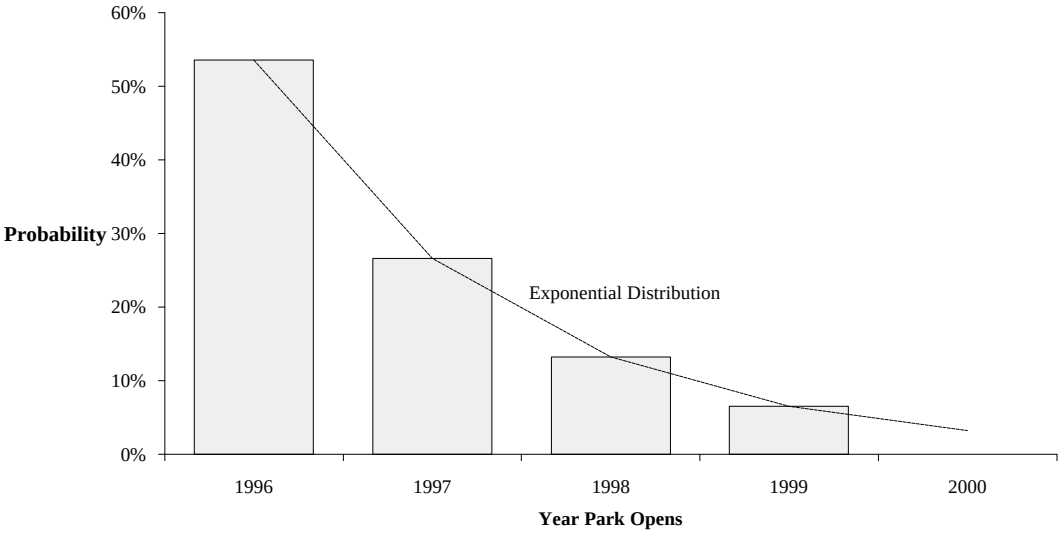
Briefly, the investment bank posited set attendance levels in increments of 100,000 from 2.5 million in the inaugural year to 3.1 million in 2005. By contrast, the probabilistic model varied starting and long-term attendance levels around the investment bank's forecast, using familiar bell-shaped patterns. In addition, the model assigned attendance levels a second, somewhat smaller bell-curve to reflect the small, but definite possibility that the park remained mainly regional. The model also varied attendance by random year-to-year fluctuations in weather and the economy. These variables were, in turn, constrained by weather patterns and the economy overseas (thus affecting international franchise expansion), as well as by—in the case of the economy—the results of general economic growth during the prior year. While these latter variables (weather and the economy) did not bias the original investment bank's forecast upward or downward, they defined the level of dispersion in attendance Oz would need to plan for as part of normal year-to-year uncertainty in structuring and negotiating financing.

Simplified Attendance Model: Double-"Bell" Curve

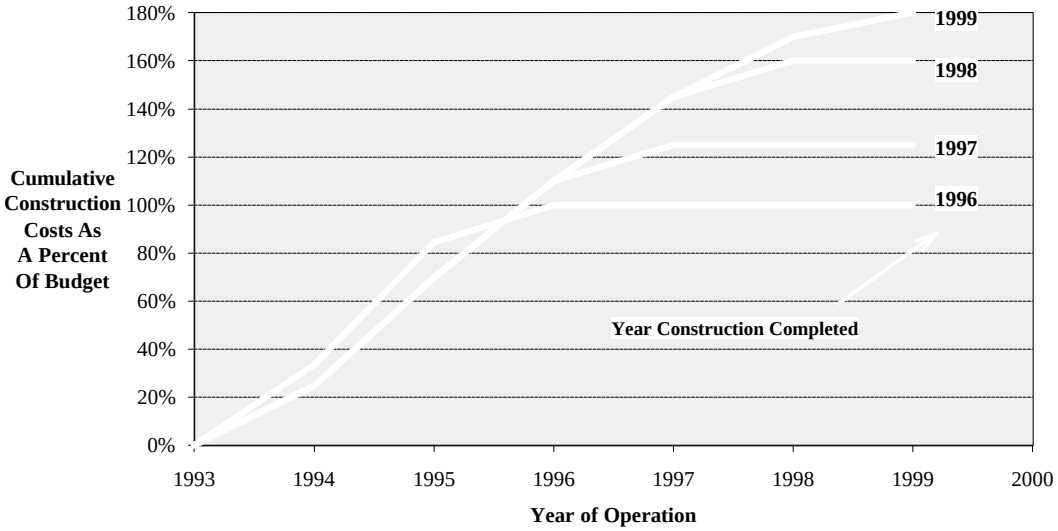


Possible construction and attendance lags were also addressed. By construction lags, I mean the possibility that the park opened late. This adjustment had implications not only for cost containment (overruns would be inevitable) and income postponement, but for the date, terms and pricing of an eventual prospective IPO. By attendance lag, I mean the number of years before attaining target long-run attendance levels. Although the investment bank assumed seven years, the probabilistic model allowed the number to vary both upward and downward, with consequent implications for investor returns.

Simplified Construction Lag Model

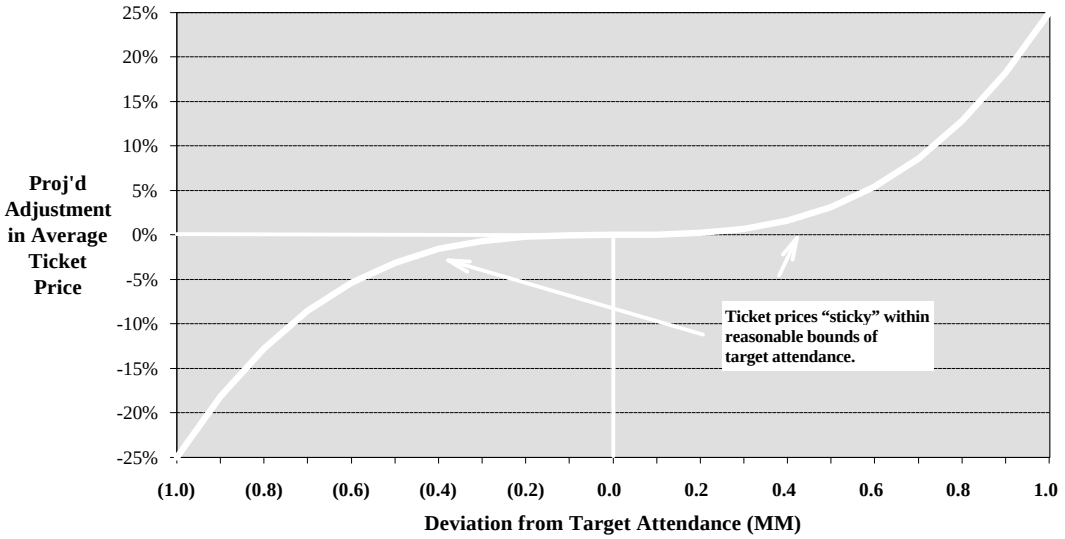


Impact of Construction Lags on Cost Overruns



The probabilistic model also deviated from the investment bank's model on pricing assumptions. Although there would doubtless be some price stickiness around target levels of attendance, abnormally high or low attendance levels would have necessitated significant price adjustments and/or inducements. The probabilistic model assumed a rather conservative 25 percent swing in average admissions price per 1 million person swing in annual attendance, but only a 3 percent departure from pricing objectives for a 500,000 person swing. The relationship was thus nonlinear.

Simplified Price Sensitivity Model



As with attendance levels, the model assigned each category of revenue per attendee a non-zero confidence interval to reflect normal pricing uncertainty—even if the park hit its attendance milestones exactly.

On the cost side, the model segregated the investment bank's cost of good sold and operating expense forecast into realistic fixed and variable components. The reason was that the investment bank had projected CGS for each revenue item as a fixed percentage. That practice made sense as long as revenue fell within a reasonable range of target levels. Outside that range, however, portions of CGS began to look more fixed than variable—especially the cost of direct labor. Consequently, the probabilistic model stripped out of each CGS estimate what we believed was its fixed component, and varied only the residual portion when there were significant variations in revenue. The impact was to leverage returns on the upside, and accelerate losses on the downside. While this structural modification was unbiased (*i.e.*, it did not alter the base case), it did make financing requirements and estimates of value far more sensitive than the investment bank's model to "what if" adjustments in attendance levels and revenue per attendee.

On the capital side, the model refinanced the venture's initial sub-debt with common stock only after the second complete year of operation, at a price consistent with the price-earnings ratio, price-to-cash-flow, and price-to-book multiple used by the investment bank in its pro forma financing proposal. Depending on the scenario, the anticipated $70 million in refinancing could cost the company anywhere between 20 and 50 percent of its equity. That is something all investors should have been aware of, and should have understood in terms of confidence intervals. The last thing the investment group needed was to liquidate or sell out four years into its venture for want of, say, $25 million—despite present ability to have anticipated and raised that amount through a more thorough, probabilistic assessment of its business plan.

For the Oz investors, a better model meant better planning. Just as no civic engineer would have planned a tollbooth based on *average* traffic, no bottleneck-sensitive business should rely on average attendance, golf rounds, hotel occupancy, food and merchandise sales, or club membership to estimate working capital and financing needs.

By persuading management that critical performance objectives like the opening date and

target attendance were asymmetrically distributed, we were able to reformulate financing requests to accommodate most contingencies. The implied financing request far exceeded the capital prescribed by management's investment bank, but it preempted a likely cause of expensive refinancing later. The exercise also opened management's eyes to the project's real value, after accounting for the one-sidedness in the distribution of possible outcomes. Planning the theme park became more deliberate, more focused, as management realized that reliable returns played a pivotal role in determining value and exit horizon.

Case 2: A Privatization Initiative

More recently, we helped a Far-Eastern company persuade a Mediterranean government that a portfolio of assets to be privatized were worth considerably less than book value. Briefly, the Mediterranean government was part-owner with several American defense contractors in a venture fund designed to sponsor indigenous middle-market enterprise. For a variety of reasons—including double-digit inflation, high real rates of interest, and political uncertainty—few of the fund's investments had paid off. Many were worthless.

The Far-Eastern company had recently purchased a major commercial bank from the Mediterranean government. Quite apart from the ill-fortune of the venture fund's previous investments, the Far-Eastern company saw the fund as providing it with an insider's track on new deals—since almost all new ventures in the Mediterranean country solicited the fund for equity. By controlling access to both debt and equity capital, the Far-Eastern company hoped to outperform its Mediterranean and American predecessors. It expressed little interest in the venture fund's old investments, but coveted the fund's apparent first access to new investments.

Persuading an owner to part with an investment at a wholesale discount to original cost is seldom easy. The task is made harder when the owner is a government during an election year. To save face, the government needed tangible evidence that a higher value could not be justified. In addition, that outside appraisal had to be reconciled with the original management forecasts which prompted the government to invest in the first place. The last thing anyone wanted was to challenge the government's competence in—at one time—approving those investments.

Rather than besmirch management's projections as wishful thinking, we felt a probabilistic critique would be viewed as more diplomatic. Specifically, we let management's assumptions about volume, average selling price, margins, working capital efficiency, and investment rates stand as the so-called "most likely" case for each investment, but then posited distributions around those variables consistent with the ranges experienced by competing companies in Western Europe. In most instances, the resulting distributions were skewed or even triangular, despite management's forecast being the "most likely."

We thus gave the Mediterranean government full credit for the ambitiousness of management's projections, but full credit as well for the possibility of attaining results consistent with leading European competitors. The result was a series of cash flow projections which, although clustered around management's forecasts, experienced *mean* values which were considerably lower. Once again, we were able to depict risk graphically, as a wide and, in many instances, one-tailed dispersion of outcomes around management's initial funding projections.

Because the depiction was not a frontal assault on the credibility of management's projections, but rather, an empirically-derived analysis of dispersion around those projections, the Mediterranean government was able to privatize the assets without appearing to reverse itself on value.

Case 3: Defining Strategy in Solid Wood Products

Both the Oz and privatization examples were relatively compact. Both had discrete objectives (obtaining adequate financing and ascertaining

value), and both were essentially forward-looking. Neither example illustrated the sixth step of corporate finance reengineering: planning contingencies.

During the past two years, we've had the opportunity to immerse ourselves in the building products industry, and thus come close to developing financial reengineering's ultimate prize: an intelligent, chess-like model of competitors' behavior in a high-stakes, capital-intensive industry.

PART FOUR: CASE ANALYSIS OF ALPHA CORP. STRUCTURAL PANELS

Alpha Corp. is a pseudonym for a Fortune 100 company. The company is a master of continuous improvement. With 21 mills and nearly 7 BSF capacity, Alpha dominates the structural panels industry. Its 16 plywood mills are the industry's most productive—producing, across-the-board, at least twice their original rated capacities. They are also the lowest cost.

Alpha's secret is scale—ironing the kinks out of labor- and cost-saving innovations at one mill before steamrolling the technology to its other mills. By conducting experiments simultaneously at each of its mills, Alpha routinely produces performance breakthroughs which cannot be matched by its less established rivals. When we began working with Alpha, it was virtually assured of preserving its low-cost status in the plywood industry..., and of being blind-sided by engineered substitutes.

Alpha revolutionized plywood production by introducing two major changes in the 1960's: (1) shifting production from West Coast Douglas Fir (the only raw material then used) to Southern Yellow Pine (SYP); and (2) building lots of large, capital-intensive mills to standardized specifications. With hindsight, the benefits of relocation were obvious: cheaper fiber, faster growth cycles, easier and year-round access, closer proximity to end markets, overlap with chip needs of the paper industry, diminished reliance on the Forest Service, and less environmental impact. By standardizing its mills, Alpha could conduct large numbers of controlled cost-savings experiments. The company thus assured itself that, in addition to sourcing cheaper materials, it could stay ahead of copycat technology. Even today, after 30 years of catch-up, the average Southern plywood manufacturer still spends 20-30 percent more than Alpha per panel. The average Western plywood producer spends 50-100 percent more. The impact, given present timber shortages, is that higher-cost Western manufacturers set the price for the industry, yielding attractive margins for Alpha.

Continuous Improvement No Longer Sufficient

Two competitive forces pressured Alpha to reexamine this long, successful reliance on TQM and continuous improvement. First was the increasingly concentrated behavior of suppliers and customers. A great advantage of relocating to the South was the atomized nature of the timber market. The vast majority of timber stands were held by small, independent landowners. In any given wood basin, mill owners were essentially monopsonists, since transporting logs out of the basin was cost-prohibitive. That purchase-power imbalance is fast disappearing as timber management consultants increasingly coordinate timber sales, and as untapped timber sources shrink.

At the same time, mega-distributors like Home Depot have redefined the ground rules for allocating producer surplus. Between stronger vendors and distributors lies the specter of an industry which, despite huge producer profits, sees less and less of it allocated to manufacturing. As Drs. Hammer and Champy would have observed, manufacturing is just one step in the process of satisfying a home builder's need for construction materials. How his construction outlays are distributed across the value chain is neither static nor wholly predictable, and is of no concern whatsoever to the consumer.

The other competitive intrusion is engineered substitutes. Just as Alpha revolutionized the plywood industry by displacing Douglas Fir, Louisiana-Pacific and others are revolutionizing the structural panels industry by introducing chip-based alternatives to veneer. In just five years, chip-based structural panels ("oriented strand board," or "OSB") have grown from less than 1 percent of production to one-fifth. And the selling price for equivalently measured sheathing products is almost identical—strong evidence of market acceptance.

Whither OSB?

This, however, is the rub. OSB is produced from smaller-diameter logs costing, on a volume basis, roughly one-fourth the cost of logs peeled for plywood. Furthermore, OSB mills consume everything, including branches and "tops." Even after adjusting for greater density and resin requirements, OSB still costs 65 percent what Alpha spends to produce plywood. And Alpha is the plywood cost leader!

The industry is thus scrambling to build OSB mills. Equipment orders suggest OSB capacity tripling during the next 5-7 years, expanding total structural panels capacity by 33 percent or more. With only modest demographic improvements, something's got to give—most likely consumer prices And the most adversely affected will be plywood producers, including Alpha.

Of course, Alpha does have six OSB mills already, and is well-positioned to build more elsewhere. There's only one catch: OSB mills are very costly to build. If panel prices crater too far, scarcely anyone will recoup their investment.

Even so, Alpha is undeniably exposed in plywood—traditionally its most dependable cash source. Especially for a company reminded of its high debt load from recent acquisitions, the need for something "fundamental" and "radical" was clear.

It was also clear that traditional reliance on continuous improvement would not alone meet the immense challenges Alpha faced. Continuous improvement could, for example, be used to shift Alpha's mix to more specialized products than OSB, but the overall market for such specialties would be relatively small, and would thus be contested by other, equally-crowded plywood producers.

Nor could Alpha hope to attain the same supremacy over manufacturing costs as it today reaps in plywood by rolling out lots of OSB mills. For one, many of the prime sites are taken. Alpha doesn't enjoy first dibs, as it did when it first ventured into SYP. Second, LP already has 15 mills to Alpha's 6, and it is better positioned to win the game of continuous improvement.

Finally, there is the recurring nightmare of over-development—and the kind of protracted boom-bust cycle that has plagued so many capital intensive industries, including paper. Sure, Alpha might win the battle to reduce cost, but suffer pyrrhic reductions in margins to the point where the cost savings weren't worth the capital invested to get there.

Like many companies in its industry, Alpha was in danger of paralysis—paralysis from fear of igniting a no-win "arms race" between panel producers, from fear that further OSB investments would only cannibalize its plywood business, and from fear that both plywood and OSB investments might be rendered uneconomic by falling prices.

Traditional Planning Tools Weren't Helpful

What was needed was a financial planning process which balanced the need for aggressive technological advancement against the danger of industry over-expansion, and which did so in light of uncertain economic conditions, governmental policy, non-wood substitutes, and competitor behavior. The problem with the conventional planning process was that it was not a process at all but a set of classical equations—a collection of point estimates which were doomed to be inaccurate because of the many independent and overlapping uncertainties influencing industry profits. Depending on the inputs, management and the board could justify anything. The impact could easily have been the

path of least resistance—continuous improvement of existing manufacturing techniques, migration to specialized (and thus insulated) product offerings, and an unspoken prayer that the industry would collapse in on itself from over-expansion, thus vindicating standing on the sidelines.

The reality was that classical point estimation techniques offered no practical way to balance overlapping uncertainties, and thus guide decision-making. Without some way of illustrating and measuring tradeoffs, the financial planning process offered no improvement over the division manager raising his finger to the wind. Indeed, the plans almost certainly were worse, since the collaboration to produce a plan inevitably involved hand-offs and disjointed judgment calls as to risk factors.

Building a Better Model

For nearly a year, we worked with the line and staff managers of Alpha to reengineer the way strategic plans were formulated. Our vision was to make them relevant—not merely at the time of development, but long thereafter by properly incorporating and automating responses to identifiable sources of uncertainty. Relevance meant more than just capturing bottom-line objectives. It meant providing managers with a bottoms-up guide to dealing with identified contingencies, and corporate staff with the means to allocate capital fairly on the basis of verifiable risk criteria.

To accomplish this, management needed to understand that all corporate strategies, all corporate tactics, connote different varieties and intensities of risk—risk which cannot be captured by a long-term forecast and uniform cost of capital. Management had first to abandon the traditional "one-size-fits-all" DCF model of performance. Harsh medicine for any company which has struggled to make line managers believe that cash flow and risk determine stock prices. And counter-productive if corporate staff can do no better than make *ad hoc* adjustments to the hurdle rate after they've first seen the investment proposal.

At minimum, the new planning process had to build differential risk into a project's cash flows, not its cost of capital. We saw this as a perfect setting for Monte Carlo-based modeling, since differential risk could, for the first time, be illustrated and modeled in a manner which was understandable to, and wholly consistent with, the way line managers viewed their business.

Complex Model, Simple Interface

Pulling such a transition off required building an industry-wide model of construction activity, finished product pricing, and individual mill profits. The challenge was to make the model comprehensive (and thus complex) enough to anticipate the business' many tradeoffs, interrelationships and regional distinctions without sacrificing clarity and management participation. We viewed it imperative that the proposed planning process—as ambitious and dynamic as it was—be dramatically easier to comprehend than the traditional DCF fire drill. The comprehension would come from the process' vastly simplified and coordinated graphical interface, not from compromises in necessary detail.

What we were dealing with was the so-called "paradox of decentralization." Decentralization in data assembly is supposed to improve efficiency, accuracy and response time by pushing responsibility down to the ranks. The reality is that decentralization often breeds chaos, by nurturing an unworkable collage of inconsistent data and assumptions.

Decentralization at Alpha extended well beyond inter-departmental bounds. Virtually every numerical entry into capital budgeting or planning was prepared by separate individuals, operating separate desktop computers, using different software, applying separate data entry formats, and finally, sharing the information by hard-copy or sneaker-net. The problem was not too little data, but too much data poorly coordinated.

Another problem was that the division's truly value-adding data systems—freight management and logistics—were imposing black

boxes. This distanced line managers from the essential simplicity of what the programs were doing (optimizing freight costs by matching mills with customers on a real-time basis).

The tendency here, as at so many companies, was to halt programming once it delivered accurate answers. In our view, that's where the real programming begins. The real programming challenge was to make accurate answers *accessible*—through a seamless, unintimidating, and widely subscribed interface.

To reduce intimidation, we chose the most widely used spreadsheet in the world, Microsoft Excel®. And we devoted slavish attention to add-ons which made intuitive sense of complex economic relationships. This meant building filters (or "gophers") to navigate the network and retrieve real-time information from previously disconnected sources. It meant investing those gophers with intelligence—the intelligence to recognize different names (or even spellings) for the same mill or product, to detect and correct differences in periodicity, to interpolate data gaps, and to prompt management when data conflicts or deficiencies called for individualized solutions.

Uncertainty is Best Described Graphically

De-mystifying finance meant representing risk graphically, so that managers could comprehend, react to, and tinker with the raft of uncertainties besetting the model and, we believe, the real world.

It also meant channeling the many disconnected corporate finance worksheets into *one*, easy-to-understand navigator, which would open and close related worksheets automatically. The vision was to make the interface so commonsense, but the resource so potent, that line managers would clamor to use it.

In most companies, planning is fragmented by so many tasks that their only shared characteristic is tedium. Participation is consequently ambivalent. Except for ulterior considerations like pay, managers devote little attention to the outcome. The result is a cycle of weak participation, weak conclusions, and still weaker participation and conclusions. Alpha sought to break the cycle. The company sought a financial management system which was so powerful, simple and immediately relevant that managers would be curious enough to participate, and having participated, be sufficiently excited to propel continued reliability and relevance.

Not all organizations are suited to the challenge. Divisional managers may be nearing retirement. Others may be more concerned with rotating to their next assignment than with challenging their present one. I observed this at one of the US automotive manufacturers, where the planning department suffered immeasurable inertia because it was constantly refreshing its management pool from unrelated departments—thus studying the same issues repeatedly. It's one reason, I suspect, why the company was recently put in play.

Alpha's CFO selected the structural panels team for good reasons. The team was young. Turnover was low. More important, the team understood how radical insights in the 1960's made them a powerhouse in the 1980's. The team also showed pride and resourcefulness in pulling the company through the difficult cash flow years following a large, unrelated acquisition. They were also keenly aware that their unit's contribution to corporate cash flow would be jeopardized by competing technology.

Reengineering Breakthroughs

Even at structural panels, the reengineering process was painstaking. Nevertheless, several developments cemented credibility early on, improving participation.

1. "Irrational" Prices Rationalized

First, the model explained erratic and lofty panel prices as a rational interaction of supply and demand. When we first began working with the unit, few managers believed panel prices bore any systematic relationship to cost or demand. Even with the intrusion of low-cost OSB, plywood producers enjoyed operating margins in excess of 25-30 percent. And prices

changed 10-15 percent a week, far exceeding movements in interest rates or housing starts. Few people on the selling floor could describe how prices were set. And few cared. They were just glad they were there taking orders. And they were perhaps a bit unnerved that a string of back-to-back bearish weeks could render them unprofitable.

To explain prices, we started with operating costs—the area where Alpha's reconnaissance excelled. Alpha's network of foresters, mill managers and sales force routinely collected (on diverse spreadsheets and slips of paper) enough data to produce a compelling picture of the industry's supply curve over the last 5-10 years. What we observed was this. Among Alpha's peers, costs differed modestly. The supply curve rose slowly and smoothly, but for a kink where OSB capacity ended and plywood capacity began. Staring at Alpha's peers, one could mistakenly conclude that panel prices exceeded anything which could be justified by cost.

The explanation was that production was near capacity. At the high end of the supply curve were a number of small, independent, predominately West Coast plywood producers with much higher costs than the industry average. In some instances, the mills were configured to peel larger logs than they could presently source. In other instances, the surrounding forests were depleted by competition and overharvesting. In still other instances, the equipment was old. The result was a cluster of mills at the end of the supply curve whose dramatically higher (and varied) costs made for extreme steepness in the cost of the final 3 to 4 billion feet of industry capacity. It was these mills, not Alpha's peers, which were filling the last plywood orders, and thus setting prices. For these companies, panel prices were very definitely a function of cost.

The exercise also explained high price volatility. This volatility, in turn, made reluctance to fold by some unprofitable mills understandable, since the mills held an option on possible future price rises.

Management thus gleaned its earliest insight—that the supply curve would flatten as additional OSB capacity pushed demand back to the more homogenous section of the supply curve. The result would be swiftly falling panel prices, as predicted by industry economists. But it would also mean diminished price *volatility*, reducing the option value associated with sustaining unprofitable mills. Of course, old practices die slowly, and it could be quite some time before marginal players realized the roller coaster ride of feast and famine had been replaced by a slow, steady death march. This slow learning process could, in turn, exert a retarding influence on industry consolidation, forcing profitable mills to forgo sales as companies vainly cross-subsidized and propped up unprofitable mills. Even mills with low variable costs could sustain damage as industry overcapacity spread volume thin.

2. Leading Research Model De-Mystified

There was a second development which, early on, helped build credibility and interest in the project. We "reverse engineered" the econometric relationships in a widely subscribed model of industry performance—the model prepared by Resource Information Services, Inc. ("RISI"). RISI is a Boston-based think-tank which publishes detailed semi-annual projections of building products activity. The building products industry pins many an investment decision on RISI's semi-annual prognostications. And it stands dolefully by when underlying conditions change, awaiting RISI's semi-annual revisions.

Reverse engineering the econometric model allowed Alpha's managers to "anticipate" how RISI *would have* modified its projections in light of changing economic forecasts or superior plant information—without waiting for the official (and highly publicized) transcript. In addition, we modified the econometric relationships to include error terms—better reflecting the imprecise nature of forecasting. Managers were thus able to visualize the impact of deviations in Federal Reserve policy as a continuum of construction activity levels clustered around a certain range, rather than as certain-to-be-disappointed point

estimates. Managers could thus visualize their exposure to macroeconomic uncertainty, but see how the odds were skewed by underlying shifts in governmental policy or interest rates.

The two developments were significant. By leveraging off Alpha's proprietary edge in engineering and forestry reconnaissance, we were able to generate a coherent explanation of the inexplicable—the volatile, high level of prices for finished product. We were also able to assist management in modifying a leading research bureau's conclusions with superior source data. Last, we turned the imprecision of econometric forecasting to advantage, as a means of quantifying exposure to uncertainty.

Attention Shifted to Measuring and Managing Uncertainty…

Once accomplished, we were able to focus management on thinking about contingencies proactively. We provided a non-statistical, highly visual format for distinguishing systematic risk from noise. And we provided a sobering illustration of how swiftly plywood manufacturers could be displaced through obsolescence. The model thus catalyzed attention on how rapidly the supply curve flattened—from convergence in saw log and pulp log prices, and from expanding capacity among the more homogenous companies in Alpha's peer group.

Strategy sessions were focused accordingly. For example, competition from OSB in the sheathing market occurred so rapidly in most simulations that plywood seemed destined to suffer, absent major extensions of product consumption. Managers thus turned attention away from non-core and comparatively small niches like furniture and boat hulls. While these areas had received considerable attention to date (with visible and promising results), the markets were simply too small to offset plummeting demand for plywood sheathing. Management instead marshaled its attention to the only consumer who could potentially absorb the industry's new capacity—the general contractor. In particular, management set its sights on lumber.

…And to Thinking Outside the Box

To date, most engineered lumber facilities (plywood, OSB and 2x4's glued together to resemble wider dimension product) have fared poorly against conventional sawmills. The wisdom is that all the extra steps of converting logs to veneer and webstock, and then gluing them together to make beams, render engineered product unprofitable against state-of-the-art sawmills. While companies are racing to produce OSB, comparatively few are racing to join it into I-Joists.

The pricing model challenged conventional wisdom. If intense OSB competition pressured structural panels prices downward, raw material costs for engineered lumber would fall as well, conferring a potentially sweeping cost advantage to engineered lumber over sawmills. That, in turn, would moderate the impact of falling panel prices on plywood mills. Taken further, invigorated competition by engineered lumber against traditional wide cuts could cause predominately West Coast sawmills to shift their mix to narrower dimensions, squeezing the many small-diameter sawmills and stud mills in the South. The ultimate cash drain, while widely presumed to be in plywood, would actually be in conventional lumber—a market which consumes 2½-3 times as much fiber as structural panels.

The immediate benefit of *modeling* the building products business, as opposed to filling in charts of accounts, was that management could make sense of the many sources of uncertainty affecting their business, and exploit the prevailing industry confusion to competitive advantage. By addressing important inter-product relationships, the building products model helped management:

- Evaluate the true risk-adjusted return from prospective OSB investments;
- Balance greenfield investments against acquisitions;
- Determine which mills should forgo capital improvements, despite significant cost-savings; and

- Develop an integrated (as opposed to product-based) strategy for maximizing the value of the Building Products group.

Critics will object that the conclusions management reached were obvious. Perhaps this is true for seasoned line managers, but it was most certainly not true for the corporate office, the company's board, or the division's peers in pulp and paper. The resources and attention devoted to reconstituting Alpha as the premier vendor of low-cost *engineered* wood products, rather than a major manufacturer of conventional lumber and plywood, could as easily have been diverted to another kraft or linerboard plant. Or to a massive stock buy-back. Management simply could not balance the wide range of alternatives without a full and unbiased appreciation of the risks involved—something classical financial analysis tools didn't provide.

In addition, there was previously no means of *proving* the need for radical change in strategy, as opposed to continuous improvement. Alpha could have methodically improved costs at its plywood mills, but lost the war to OSB. It could have penetrated ever further into niche products and specialties, but found an unexpected tide of competition from sheathing manufacturers. There was previously no means of satisfying anti-alarmists that the alarm bells were real—that a *status quo* future would be an outlier.

Not all the strategic decisions have been made at Alpha. And Alpha still has far to go before realizing its vision of a fully-subscribed, real-time, "contingency-aware" planning model. The company is nevertheless close to its vision in building products, and has registered substantive changes in the way it plans its future—ways which vastly improve the likelihood that it will be a beneficiary (and not casualty) of technological change.

PART FIVE: DISTILLING ORDER FROM CHAOS

The chasm between line managers and corporate personnel can be narrowed. But it won't happen as long as line managers communicate their business options and prospects to corporate officers and outside experts using a static collection of "best", "worst" and "most likely" case scenarios. Nor will it happen if corporate officers and outside experts continue to describe the world to line managers as a series of hard-and-fast targets. The static case-oriented model of target-setting and performance measurement is simply inconsistent with the vagaries of a "real world" business climate.

Planning is made meaningful when it embeds uncertainty explicitly into the target-setting and investment appraisal process. This is made possible when corporate managers develop probabilistic models, not individual forecasts, to describe their businesses. Such models modify performance targets to reflect changes in macroeconomic conditions beyond management's control, and do so in a manner which is widely understood and accepted in advance.

Such models also provide guidance as to the distribution of aggregate performance measures, since they can be run on a PC hundreds of times—allowing competitors' behavior and the economy to vary randomly, but in accordance with well-defined patterns. These distributions can be used to determine, for example, how steep management's hills are to climb, and thus how to calibrate an incentive plan.

In addition, the hundreds of simulations generated by a single probabilistic model divulge many paths to the same EPS, ROE or EVA. A quick discounted cash flow comparison will reveal, however, that only one such path is value-maximizing. The database of simulations thus becomes a powerful practical guide for identifying which specific tasks and decisions of management are most consistent with increasing stock price—not just an accounting target.

Finally, the database of simulations shows how clustered value-enhancing patterns are, and thus each pattern's probability of attainment. It is quite possible, for example, for a value-

maximizing strategy to be outweighed by a less ambitious, but far more probable, value-enhancing strategy.

The key distinction between a probabilistic and a traditional modeling approach is that the probabilistic approach is dynamic. On any day after generating the forward plan, there will be a subset of scenarios which fit existing circumstances, and which paint a realistic, probability-weighted mural of subsequent outcomes. Those scenarios which offer the greatest promise of stockholder return can then be distilled into line-by-line guides for re-focusing management attention, and for reevaluating corporate expectations. Management's focus can thus be shifted to beating the odds it faces, given circumstances to date, rather than surpassing static, out-of-date targets. This is closer to the perspective of stockholders, who make extraordinary returns only if a company's stock outperforms market expectations—expectations which adapt constantly to emerging circumstances.

We recognize that phrases like "probabilistic", "PC" and hundreds of times" conjure up images of mad scientists tinkering on sub-basement mainframes. The reality is much gentler. The power of off-the-shelf spreadsheets and add-ons has advanced so far that, for most companies, the transition to measuring and managing uncertainty is intuitively appealing and methodical.

Simulation-based planning models have now been used at several companies to test growth opportunities against uncertain competitor behavior, improving the odds of costly wagers. In addition, the simulation-based models have helped finance professionals assume previously unheard-of frontline responsibilities—anticipating, rather than reacting to, changing business conditions. Finally, they have been used to make objective, performance-based incentives attainable, by (1) allowing fair comparison of how difficult milestones are to achieve, and (2) distinguishing management's discretionary contributions to share value from the often overshadowing role of the economy.

These applications are only the tip of the iceberg. There are many scholars and practitioners who believe that three-dimensional modeling is the next great advance in corporate finance—as revolutionary as the two-dimensional DCF and Black-Scholes models were to the last two decades. We now live in a world in which chaos has become the norm. Those who can distill order from chaos, by making planning exercises "contingency aware," will be the business leaders in the 21st Century.