



Creating Value Through Innovation

Edison knew innovation meant much more than development of new products. That's even more true in the New Economy.

A New Economy Series White Paper
from Cambridge Technology Partners

Foreword:

The telegraph ranks among the most significant achievements of modern times.

By liberating the delivery of communications from the limits of physical transportation and from humans' sensory boundaries, the new medium ushered the world into the information age.

Invented almost two centuries ago, the telegraph sparked innovation on an unprecedented scale. It immediately precipitated flurries of incremental improvements in telegraph technologies – great strides were made in transmission quality, and very quickly, the technology standardized around Morse Code. It even began to change the way that businesses were organized. Many firms dramatically reinvented themselves to exploit its advantages. Other sectors were annihilated. Soon, who needed the Pony Express?

The land grabs and surges of speculation that characterized the telegraph's early days show that **the goal of innovation in a business context – to gain a monopolistic hold on a new market – is as old as capitalism itself.**

Success then, as now, required a three-point strategy. Contenders had to get in early, rapidly grow their user networks before competitors arrived, and focus on core competencies to stake out defensible positions.

As with every Next Big New Thing, the telegraph generated a range of innovations that conforms to a hierarchy of value creation. On top are layers of disruptive innovations such as new business models that reconfigure industries, or new technologies that redefine product categories. Lower down are the incremental innovations that seek to improve existing products, services, or processes.

What's different today? In two words: the Internet.

Its unique facility for slashing coordination costs – the costs of liaison between, say, a customer and a supplier – fosters unprecedented levels of business-model innovation. Plummeting transaction costs, greater market liquidity, and more partner transparency are just some of the Internet-fueled realities that allow innovative business models to continually emerge.

Please do not presume you're OK

because your firm has an entrenched "innovation process" or funds an "innovation engine." Geared to deliver incremental innovations only, they will not support the disruptive innovations needed to reinvent your business model. And both types of innovation absolutely belong in your portfolio of options in the New Economy.

This white paper puts the innovation discussion on a new plane. It sketches out the innovation-value hierarchy. It explains the link between innovation and value creation, and concludes with a self-diagnostic tool that will help you determine where you truly stand in the innovation game.

Table of Contents

	Introduction: A New Lexicon For Innovation	4
	Innovation: The Quest For Dominance	7
	The Innovation Lifecycle: All The World's A Stage	14
	Case Study: A Look At The Pharmaceutical Industry	16
	Diagnostics: Rating Your Innovation Capacity	21
	Further Browsing: Sources And References	23

Introduction:

A New Lexicon For Innovation

Now that the Internet is adding new dimensions to innovation, we need a new vocabulary to describe the changes.

fewer can see beyond conventional beliefs about innovation – they assume it’s all about new-product development, or a new manufacturing process – to broader interpretations that are key to high performance in the New Economy.

Those misunderstandings underscore the need to develop a new lexicon for innovation.

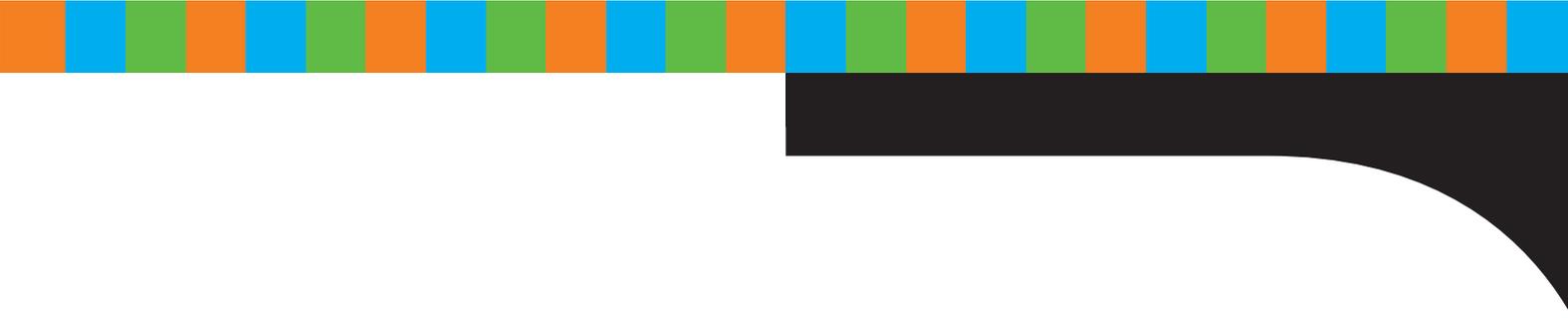
In 1942, economist Joseph Schumpeter eloquently captured one essence of innovation when he coined the term “creative destruction.” Embodied in this descriptor is the relentless leveraging and augmentation of prior innovations to create new, higher-valued innovations. The “standing-on-the-shoulders-of-giants” quality of this definition hints that innovation is the result of continual improvements in relatively stable environments. Schumpeter also believed large corporate incumbencies were the bastion of innovation, which implies that innovation is a predictable, low-risk endeavor.

But what happens when the power of incumbency becomes meaningless? The

work of Harvard professor Clayton Christensen picks up where Schumpeter leaves off. In his 1997 book *The Innovator’s Dilemma*, Christensen postulates that incumbents become so entrenched in serving their existing customer base that they fail to comprehend the disruptive impact that new technologies can have on their markets. Thus, disruptive technologies lead to the eventual displacement of incumbents. In the early stages, the risk is moderate, increasing dramatically as the new technology achieves critical mass.

Starting with the disk-drive industry as example, Christensen shows how most of the first companies to dominate the sector were eventually displaced by new entrants. These firms developed smaller disk drives, with lower functionality, targeted at small markets not served by the incumbents. While doing everything right to serve their existing customers, the incumbents failed to appreciate the value/performance “trajectory” of the newer technology. By the time they realized the new technology had evolved to meet the needs of the mainstream market, it was too late. As a result, the new entrants knocked the incumbents off their market-dominating pedestals.

In an economy predicated on intellectual and relationship capital, few would argue that focused innovation leads to value creation. A recent study commissioned by *Forbes ASAP* magazine found that innovation was the dominant lever in the value-creation process – in most instances, more influential by far than customer satisfaction. But few understand what innovation is, much less how it impacts the creation of value. And even



Ironically, many of these “new incumbents” were similarly dislodged by the subsequent waves of new entrants.

Christensen’s work highlights an important lesson. By focusing on existing customers, the incumbents emphasized incremental innovation that improved existing products. Thus, they took their eyes off the technology ball and neglected the potential future impact of newer technologies on their markets. In other words, they failed to develop a portfolio approach that balanced both incremental and disruptive innovation. As in a Greek tragedy, Christensen shows how this scenario repeated itself in disparate industries such as computers, excavation equipment, motorcycles, and steel.

The Internet brings the Christensenian view to a higher level. Now, smaller firms with less physical capital and new business models can (and do) emerge overnight – and from anywhere in the world. Honing their core competencies while fluidly partnering to access complementary expertise, they threaten to dynamically reconstitute the economies of scope previously attainable only by large hierarchies.

Trigger Event

There is another factor in the disruptive innovation equation: dramatic shifts in new business models are preceded by a breakthrough or trigger event. The telegraph shattered the time lags associated with physical transportation of information. The steam engine, the internal combustion engine, and heavier-than-air travel spawned the rise of the railroad, automotive, and airline industries respectively (as well as ancillary industries such as auto rental, travel agencies, etc.). The Internet combines forces such as global reach, decreasing transaction costs, and increasing returns to scale to drive the emergence of new business models. And other disruptive catalysts are on the horizon. The mapping of the human genome promises to redefine the pharmaceutical and insurance industries. Fuel-cell technology may replace the internal combustion engine, dramatically affecting the petroleum industry in the process.

A central theme of this paper is that successful innovation leads to value creation. Therefore, we need a definition of value creation. In this paper, when we discuss value we are referring to a firm’s market valuation. For publicly traded firms, market valuation is simply the

aggregate value of all outstanding shares. For private firms, value equates to the market-valuation assessment that venture capitalists would perform prior to taking a firm public. Because information on publicly traded firms is more accessible, the examples we cite are limited to public companies. Value creation, then, represents any period-to-period appreciation of existing capital, all other factors held constant.

Definitions:

Incremental Innovation:

The continual refinement and enhancement of existing products, services, or processes within a relatively stable competitive environment.

Disruptive Innovation:

The focused exploitation of emerging technologies to radically reinvent industries (via new business models) or to displace incumbent product or service offerings in existing markets.

Value: The market valuation of a publicly traded firm (market value of outstanding shares) or market-value assessment of a privately-held firm.

Value Creation: Period-to-period appreciation of existing capital, all other factors held constant.

The Innovation-Value Hierarchy

There is a well-known maxim concerning risk and reward. The higher the risk, the higher the expected payoff to those who fund the risk. Successfully execute in a high-risk environment, and shareholders are rewarded with a dramatically enhanced market valuation.

To help clarify the discussion around levels of innovation, Cambridge Technology Partners has devised the concept of an innovation-value hierarchy. High-risk disruptive innovations, if successful, should garner the highest market valuation premiums. Predictable, incremental innovations should induce smaller premiums. To appreciate this concept, one has only to compare the large market value-to-capital

ratios of successful dot.com businesses, which exploit innovative business models, to those of staid industrial giants that are constantly striving to incrementally increase process efficiencies.

Look at VerticalNet, Inc., whose business model was initially panned for developing industry-specific communities built around 56 online trade magazines. Those communities gave VerticalNet the critical mass it needed to leverage its way into business-to-business transactions. Now, many view VerticalNet as a prototype business-to-business site. In fact, the company is partnering with Softbank and British Telecom Plc. to create versions for the Asian and European markets. The company, which is expected to reach \$130

million in revenues for 2000, commands a \$3.1 billion market capitalization.

The innovation-value hierarchy presents your primary innovation decision point. What type of innovation can you undertake – disruptive or incremental? Having what it takes to succeed in incremental innovation does not translate to an ability to master disruptive innovation. In fact, they are often at polar extremes. Throughout this paper, we will build on the innovation-value hierarchy, culminating with a diagnostic to assess your innovation capacity.

First, let's review the goals and strategies that drive innovation. ■

Take The Risk, Reap The Reward

	Goal	Innovation Focus
Disruptive Innovation	Reinvent Industry	Business Model
	Reinvent Category	Product / Service
Incremental Innovation	Refine Product or Service	Product / Service
	Streamline Execution	Process

Value Creation

High

Low

Low

High

Power of Incumbency

Source: Cambridge Technology Partners



Innovation:

The Quest For Dominance

It's not about the new ideas for their own beauty. Successful innovation leads to uncontested market presence, which sires high market value.

The business press is awash with articles touting the importance of innovation. Harvard Business Review, Sloan Management Review, and Fortune, to name a few, have all recently published articles hailing its strategic significance.

However, there is a subtle point that many of those articles miss. Successful innovation does not cause value creation. It leads to it. So then, how are innovation and value creation linked? What drives businesses to innovate? Economists such as Paul Romer and W. Brian Arthur provide an elegant, capitalistic answer. Innovation is driven by the lure of quasi-monopolistic power. Obtaining uncontested market presence, even for a short time, is enough to fuel innovation. Efforts to be first to market can be rewarded with acceptance by crucial early adopters, which can lead to increasing returns to scale and potentially higher margins to subsidize the next round of innovation. It is a virtuous circle that can reinforce market dominance. That dominance, in turn, leads to premium market valuations.

If dominance is the goal, what is the strategy? Throughout the capitalist era, successful innovators invoke variations on a three-point strategy. First, they get in the game early. Second, they aggressively expand their user networks. Third, they focus on defensible, value-adding competencies.

The shift to a networked economy is intensifying these strategic tenets. The convergence of network economics, shortening business cycles, increasing returns to scale, and the law of comparative advantage are recasting the classic three-point strategy. Let's take a closer look.

First Mover Takes All

Remember the classic bell-shaped market-maturity curves that neatly classify buyers into early adopters, mainstream, and laggards? A business could choose to play the role of market leader, fast follower, or late entrant.

Well, those conventions work fine in stable markets with long business cycles. Compress these cycles to 18 months or less, and it's a new ball game. Erase the

laggard category; market leaders won't have time to court them. Eliminate the late entrants; they'll relinquish more and more of their market presence to first movers (see sidebar: "Advantage, First Mover.")

A textbook example of the "winner-takes-all" phenomenon is Amazon.com, which turned the staid book-selling trade on its ear. In Amazon's case, the innovation centered on a business model that separates information about well-defined commodities (books, music, videos) from the physical inventory and fulfillment processes. This allows Amazon to compete using information about books to present a huge "virtual inventory" to customers. As of June 2000, Amazon had a market value of \$11.9 billion. With its own capitalization of \$1.4 billion, fast follower barnesandnoble.com is still struggling to catch up. And the revenues of late entrant Borders.com are an order of magnitude lower than those of Amazon.

Innovation is an inherently risky proposition. It requires significant up-front investments in R&D or customer acquisition. And market acceptance is not guaranteed. Thus, it is insufficient to

simply be first to market. Quasi-monopolistic status will be granted to the first mover to successfully exploit emergent market opportunities. The successful

contender will recoup prior R&D or customer acquisition expenditures and live to subsidize future innovation investments.

To do so, it's vital to harness the second stage of the three-point innovation strategy – the power of network economics.

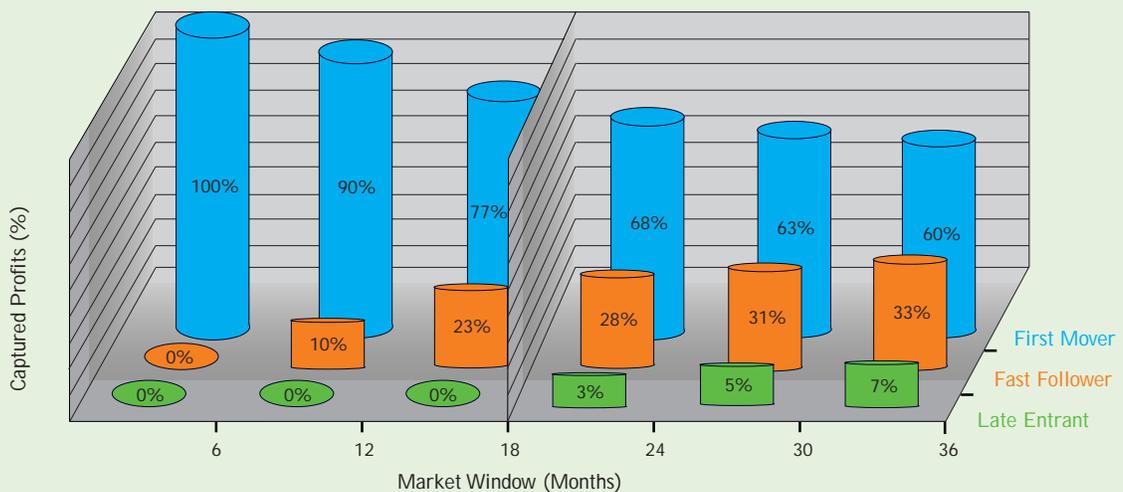
Advantage, First Mover

A few quick calculations show that the clear profit win goes to those who are first to market.

Basing our numbers on research done by the Iacocca Institute at Lehigh University, which shows that about 80% of profits are realized during the first half of a market window, we can extrapolate profits breakdowns for three companies pursuing a market opportunity that lasts three years.

Company A is first to market. Fast follower B enters six months later; late entrant C arrives when the market is 18 months old. Under these conditions, Company A will grab 60% of the profits while B would earn 33% and C gets 7%. Now shrink the window to 18 months. If the market entry timings remain constant, the profit distribution changes to 77% for A, 23% for B and zero for C.

The implications go beyond the profit split. Company A's fatter profits allow it to further entrench itself in the market, but B and C have less to re-invest and so fall further behind. A pivotal lesson: those that get ahead tend to gain positive momentum; those that fall behind tend to lag further – and faster.



Source: Cambridge Technology Partners



Network Effects

In evolutionary biology, the initial success of a new species is greatly influenced by its ability to rapidly radiate across the environment and entrench itself before competitive species enter the fray. Business buzzwords such as “viral marketing” or “market diffusion” have their roots in this concept. Once an exploitable opportunity presents itself, the objective is to grow the user network rapidly, before competitors can do so.

Economist W. Brian Arthur explains the power of diffusion in two ways. First, there are network effects, whereby the larger the network of users, the more likely the product will become a standard. Second, familiarity with a product or service, including training and use, creates a lock-in effect. Thus, the more users you acquire, the harder it becomes for competitors to enter the market. Consider Hotmail Corp., which provided free e-mail and quickly captured over 10 million users. The only way Microsoft Corp. could deal with the competitive threat to its Microsoft Network (MSN) was to acquire the company – for \$385 million.

As the customer base expands, it is usual for the marginal cost to produce a product or acquire a customer to decline. The law of increasing returns postulates that the more your market expands, the more advantage you stand to gain. Consider America Online Inc. With its “buddy lists,” AOL transforms users into advocates who sell their friends on the benefits of joining AOL. This reduces AOL’s customer-acquisition costs, thereby increasing margins. Microsoft exemplifies a firm that enjoys the effects of increasing returns (see sidebar: “Justifying Microsoft’s Margins.”)

But there is a dark side to network effects. The less adaptive you are to market shifts, the faster your market position will erode. Get behind the innovation curve or cling to an obsolete business model and you’ll lose your market position. Look at Encyclopedia Britannica Inc., which initially scoffed at the concept of a CD-ROM encyclopedia – an innovation that almost put Britannica out of business. Innovation-driven Darwinism? Absolutely.

The drive for ubiquity draws into question just whom you will be competing against in the New Economy.

Consider the battle for supremacy in Internet browsers. Microsoft was able to counter Netscape Communications Corp. by leveraging its dominance in the operating-systems user base. One could argue that Netscape simply sought to



Quasi-monopolistic status will be granted to the first mover to successfully exploit emergent market opportunities. The successful contender will recoup prior R&D or customer-acquisition expenditures and live to subsidize future innovation investments.

capture the lion’s share of the browser market, viewing the browser as an application that would seed a new market. In hindsight, Netscape was pushing the browser into a user base dominated by Microsoft – namely the users of the various Windows operating systems. From Microsoft’s perspective, this was an existing market where browsers are an incremental enhance-

ment for a user base that it controlled. In the end, Microsoft proved to be an incumbent that could not be dislodged.

The Netscape-Microsoft battle demon-

strates the downside of ubiquity – the transition from novelty to utility. In the early days, the browser was a disruptive innovation. It redefined the use of the Internet, transforming it into a

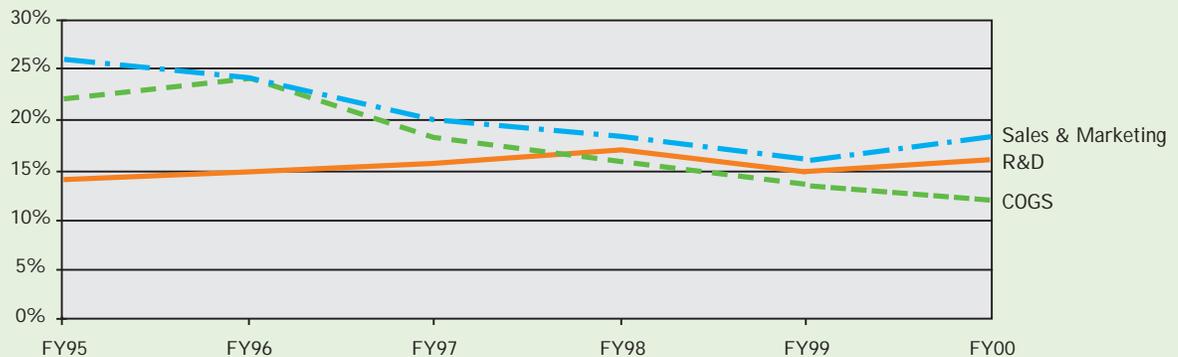
commercial medium. As the nascent Internet world matured, the browser itself became an indispensable utility on every PC. Thus, it was a logical progression for the browser to be

Justifying Microsoft's Margins

Under the law of increasing returns, pricing mechanisms put forth in traditional economic theory, which are based on production costs and "perfect competition," go out of the window. Let's take Microsoft Corp. as an example. If Microsoft set its prices at the same gross margin levels used by the auto industry, a copy of Windows NT would cost 20% of what it does now!

Microsoft is typical of businesses that experience increasing returns. Its cost of goods sold as a percentage of revenue has dropped from 22.2% in fiscal 1995 to 13.0% in fiscal 2000 – a decreasing marginal cost per unit as Microsoft amortizes costs over an expanding user base. Also, Microsoft's sales and marketing as a percentage of revenue has dropped from 25.7% in 1995 to 18.0% in 2000. This suggests lower acquisition costs per customer.

Using an industrial pricing strategy would detract from Microsoft's twin objectives, the first of which is to have margins sufficient to recoup its up-front R&D investments. Suppose Microsoft invested upwards of \$250 million to develop Windows NT. These investments represent the cost to produce the first CD. The cost to produce the second CD? About \$1.50 (distributing Windows NT on the Internet would result in zero production costs!). The second objective is to use its generous profit stream to invest in future innovation.



Source: Cambridge Technology Partners

subsumed by the operating systems on which the browser ran.

A similar scenario played out in the dramatic shift from novel business-to-consumer to utilitarian business-to-business Web sites. The B2C sites enticed investors and misdirected many corporations' initial forays into the networked economy. The latter is proving to be where the real Internet opportunity lies. This awakening is fueling the current shakeout in the Internet industry, where

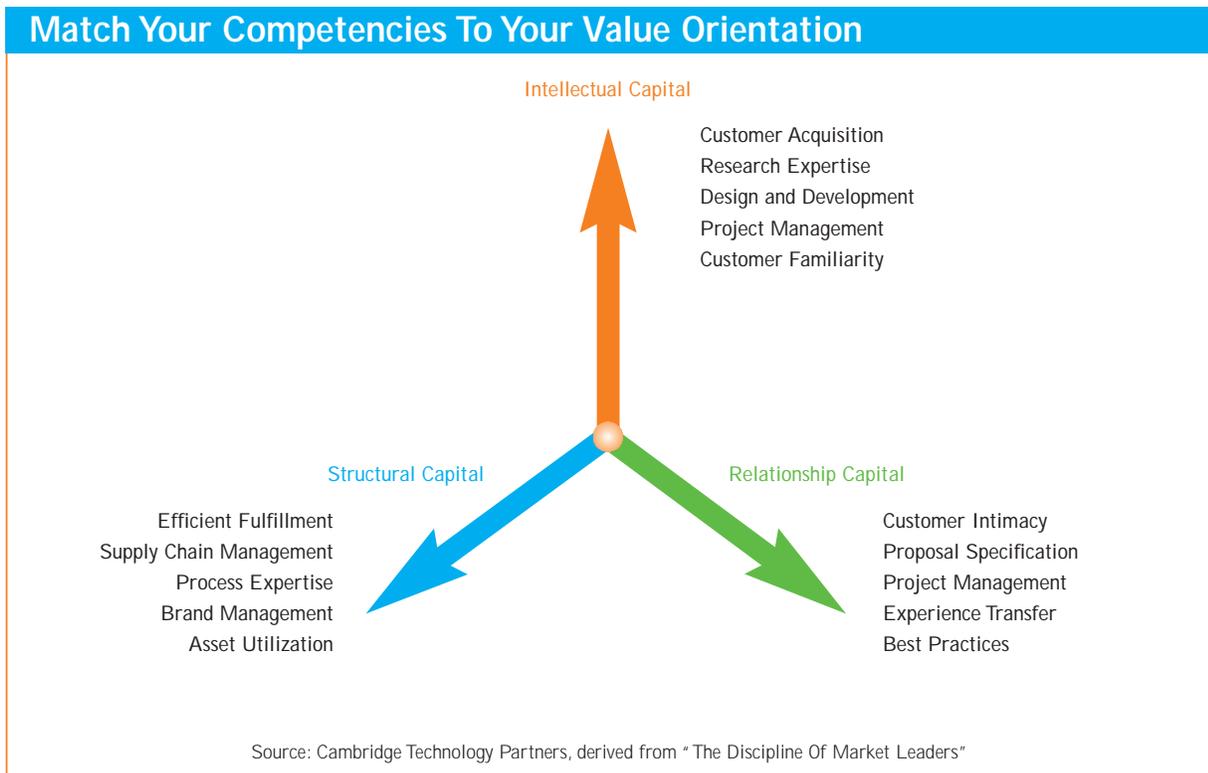
novel dot.com companies with marginal business plans and no signs of profits are falling victim to investors' needs for returns on their investments.

The high-tech industry is rife with examples of empires unrealized for lack of a market-diffusion strategy. Check out Lotus before the IBM acquisition. The exorbitant pricing of the innovative Lotus Notes product severely limited its market penetration. Consider Apple Computer Inc.'s decision not to license the

technically superior Macintosh to clone makers. When the Windows market hit critical mass, software developers had much less motivation to emphasize developing Mac versions of their products. Apple was doomed to remain a niche player.

Competency-based Innovation

Being a first mover armed with a market-diffusion strategy is necessary, but it's still not a complete approach. Your customers or business partners must value



your offering more highly than all alternatives. Remember: the Internet's reach allows sourcing to occur globally. Thus, it is possible to reconstruct value chains using only "best of breed" offerings, regardless of where those offerings are produced or headquartered. This will require you to focus on your core competencies – the value-adding activities that you perform better than anyone else.

Nineteenth-century economist David Ricardo was the first to contemplate the benefits of specialization, which led to the law of comparative advantage. His initial framework examined two countries, each able to produce two commodities. He proved that each

country should specialize in producing the commodity where it has an advantage compared to the other country. Through specialization, the world output of both commodities increases. In other words, by leveraging each country's competencies, the aggregate value produced is maximized. Economists have long used Ricardo's insights to argue against protectionist trade barriers that favor domestic production over comparatively advantaged foreign production.

The law of comparative advantage has profound implications as we move into the New Economy. In the industrial era, high transaction and coordination costs made it economically more feasible for vertically integrated hierarchies to

provide economies of scope by owning the entire value chain. Sub-optimal performance of any link in the chain was offset by the aggregate performance of the entire chain. In essence, transaction costs acted as trade barriers that favored large hierarchies over small firms.

In the Cambridge Technology Partners' white paper entitled "Business Models for the New Economy," we argued that as the Internet drives down transaction and coordination costs, those barriers will rapidly erode. Vertically integrated firms will find it increasingly difficult to compete with networked partnerships. In the New Economy, each network participant specializes based on the knowledge, competencies and complementary assets

Disruptive Innovation Strategies Demand Different Competencies...

Goal	Strategy Components				Examples
	First Mover to Introduce...	Target User Network	Competency Capital Base	Leveragable Competencies	
Reinvent Industry	New Tech-enabled Business Model	Early Adopters within Incumbent's Customer Base	Intellectual Relationship Structural	<ul style="list-style-type: none"> Customer Acquisition Partner/ and Alliance Management 	<ul style="list-style-type: none"> Dot coms eMarkets MP3
Reinvent Category	New Technology into Existing Market	Early Adopters outside Incumbent's Sweet Spot		<ul style="list-style-type: none"> Research Expertise Design and Development Experience Transfer 	<ul style="list-style-type: none"> Biotechnology Online Brokerages

Source: Cambridge Technology Partners

where it has a comparative advantage over other potential partners. In this way, the aggregate value of the network output can be maximized.

An initial challenge is to correctly identify your firm's core competencies (see "Rating Your Innovation Capacity," pg.21), which are related to how you plan to deliver value to your customers and partners. In their 1995 book "The Discipline of Market Leaders," authors Michael Treacy and Fred Wiersema proposed that firms focus primarily on one of three value dimensions. Customer-oriented firms focus on leveraging relationships with customers and business partners – that's relationship capital. Product- or service- oriented firms tap

into the brains of their employees (intellectual capital) to create new offerings. Finally, operationally focused companies leverage their assets (structural capital) to outperform competitors. It is Cambridge Technology Partners' contention that each of these dimensions has an associated set of core competencies. Later in this paper, we'll present a framework for assessing your core competencies and mapping them back to the type of innovation you are geared to perform.

Linking Strategies to Value Hierarchy

How the three-point innovation strategy manifests itself depends on the type of innovation you are striving to achieve. The charts below outline how the various

strategy pieces fit together. For example, Amazon.com leveraged customer acquisition and partner- management competencies to reinvent an industry. The company used an innovative business model targeted at techno-savvy early adopters in the incumbent's customer base. Pharmaceutical firms, on the other hand, are leveraging product-development competencies to continually refine products targeted towards the existing customer base. ■

...Than Do Incremental Innovation Strategies					
Goal	Strategy Components				Examples
	First Mover to Introduce...	Target User Network	Competency Capital Base	Leveragable Competencies	
Refine Product or Service	New Product Improvements and Features	Mainstream Customer Base	Intellectual Relationship	<ul style="list-style-type: none"> Design and Development Project Management Best Practices Brand Management 	<ul style="list-style-type: none"> Pharmaceuticals Software
Streamline Execution	Time and/or Cost Savings	Business Partners	Structural	<ul style="list-style-type: none"> Supply Chain Management Efficient Fulfillment Asset Utilization 	<ul style="list-style-type: none"> Manufacturing Telecom

Source: Cambridge Technology Partners

The Innovation Lifecycle: All The World's A Stage

There's an innovation-value continuum that "disruptive" firms typically follow.

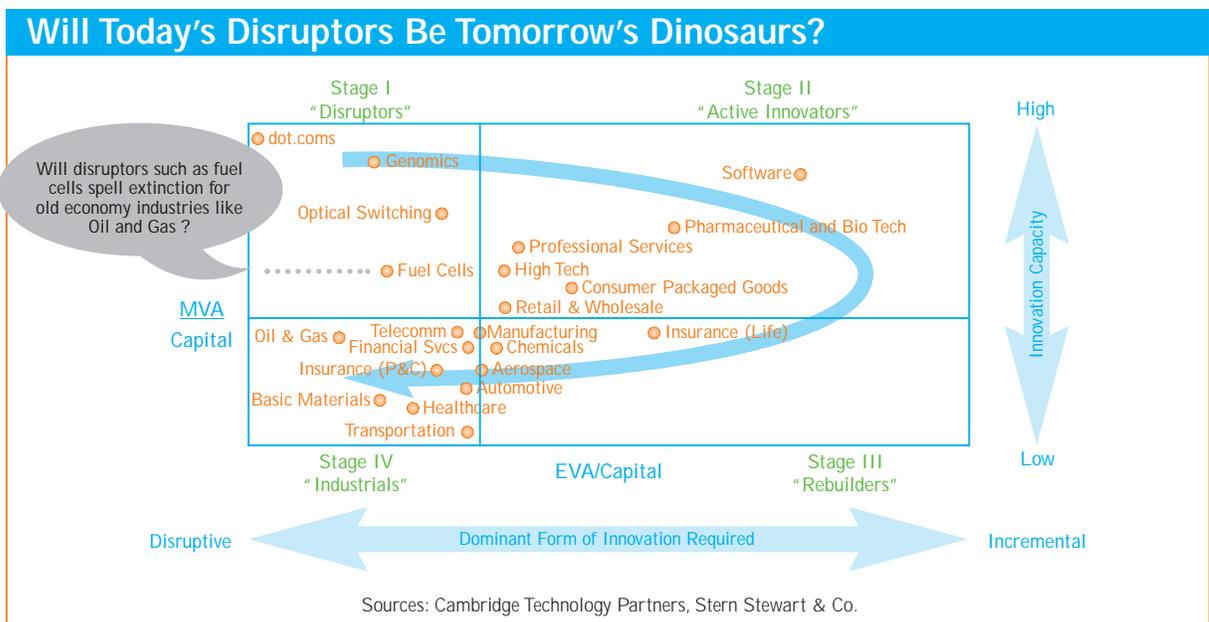
The question remains: does innovation lead to value creation? Using 1999 data from valuation experts Stern Stewart and Co., we examined the performance of 1,000 companies in 22 industries. Our analysis strongly suggests that successful innovation is indeed a potent catalyst in the value-creation process. We used economic value added (EVA) as a proxy for the predominant form of innovation. (See sidebar: "The Mechanics of MVA and EVA.") A positive EVA means an industry is generating real economic profits and is dominated by incremental

innovations that refine or enhance existing offerings or processes. A negative EVA, on the other hand, indicates industries that are economically in the red and ripe for disruptive change. The lack of profits is typically indicative of overcapitalization of an "old economy" industry or high levels of initial investments in "new economy" business models.

To gauge innovation capabilities, we analyzed the market value added (MVA) performance of the 22 industries. MVA is simply the difference between a company's

market valuation (or market capitalization) and the capital that has been invested in the firm. High MVAs indicate that investors are confident in the ability of an enterprise to generate future economic profits. If successful innovation is key to the long-term viability of an industry, then investor confidence, as measured by MVA, is a solid metric.

Combined, the EVA and MVA analyses reveal some intriguing characteristics of the transition to the New Economy. First, the chart suggests that disruptive firms enter in the upper left and progress clockwise through the innovation-value continuum. It looks like this:



The Mechanics of MVA and EVA

Stern Stewart & Co. has developed a widely accepted valuation methodology that allows performance analysis on both the company and industry level. The firm advocates analyses of economic value added (EVA) and market value added (MVA) to determine whether a firm is generating economic profit (EVA) and creating shareholder value (MVA).

At its most basic level, EVA is net operating profit after taxes minus an appropriate opportunity cost for the capital invested in the firm. Simply put, MVA is the difference between the market valuation of the firm (share price times shares outstanding) and the economic capital employed by the firm.

EVA = (Net Operating Profit After Taxes) – (Weighted Average Cost of Capital x Capital Employed)

MVA = (Market Capitalization) – (Capital Employed)

Source: Stern Stewart & Co.

The sectors that represent disruptions to traditional business models, most notably the dot.com companies, fall in the upper left quadrant (Stage I). Despite the fact that these firms are hemorrhaging red ink, investors continue to throw capital their way. This is not as insane as it might appear. At this stage, the top priority for the dot.coms is leveraging network effects to grab user share, not short-term profitability. However, while it's important, this situation is not sustainable. Investors are willing to gamble that some of the dot.coms will secure their market positions and begin to turn enormous profits. Those that fail to do so will disappear. Stage I is where you will find other nascent disrupters

such as genomics firms and companies developing fuel-cell technology. The June 2000 announcement of the initial draft of the human genome increased awareness of the important role that companies such as Celera Genomics Group will play in the not-so-distant future. The emergent genomics industry will profoundly impact the pharmaceutical and healthcare industries. For its part, the emerging fuel cell threatens to have a significant affect on both the automotive and petroleum industries by eliminating the need for conventional internal-combustion engines.

In Stage II are the six sectors that dominate the EVA/MVA race: software, pharmaceuticals, consumer packaged

goods, high technology, retail and professional services. Each of these industries creates value through different means of innovation (continued on p.18).

A negative EVA indicates industries that are economically in the red and ripe for disruptive change. Their lack of profits is typically indicative of overcapitalization of an "old economy" industry or high levels of initial investments in "new economy" business models.

Case Study:

A Look at the Pharmaceutical Industry

Product-oriented firms often have more discrete business models that allow for direct analysis of the effects of innovation on value creation. We chose to analyze the performance of the top U.S.-based pharmaceutical companies – a decision bolstered by a recent study conducted at McMaster University which, by examining total R&D investment and R&D investments relative to sales, ranked top R&D-based innovation industries as:

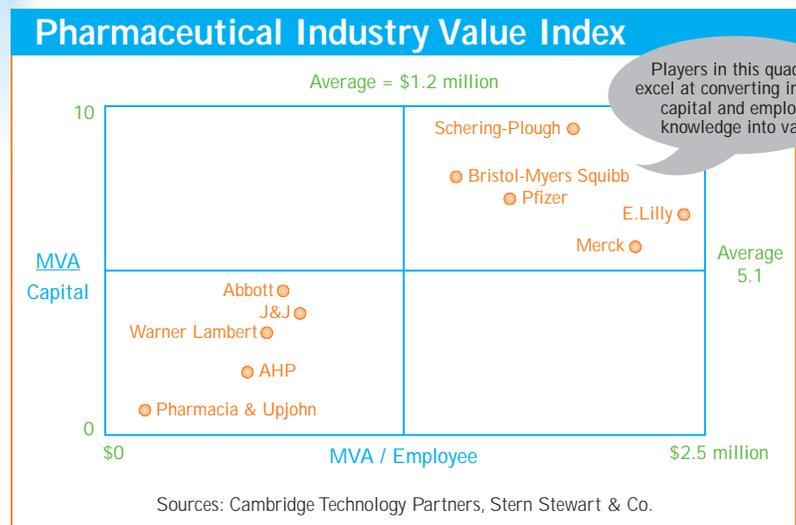
1. Pharmaceuticals and biotechnology
2. Prepackaged software
3. Telecommunications equipment
4. Semiconductors

As before, we assume that MVA provides an accurate reflection of value created by an enterprise. Second, we assume that the knowledge supplied by people is the basis of each firm's intellectual capital and core competencies. Thus, MVA per employee can be used as an accurate measure of the relative performance of knowledge and competencies within the firm. Then, market capitalization divided by capital measures the ability of a firm to convert capital into shareholder value. Using 1997 and 1998 data as a basis of

comparison, we can objectively assess the performance of the ten largest U.S.-based pharmaceuticals.

In the upper-right quadrant of the above diagram are those firms that created

In working with its clients in the pharmaceuticals industry, Cambridge Technology Partners found a 92% correlation between the economic capital utilized by these firms and MVA. For this



higher-than average MVA/employee and market value/capital. This means they excelled at creating true economic profit per employee. It also means they out-performed in their ability to convert their existing capital base (including R&D investments) into investor value. In the lower left are the firms that under-performed in terms of value creation and retention. These are the firms at greatest risk of falling behind the innovation curve.

type of analysis, R&D expenses are capitalized. Thus, for pharmaceuticals, R&D investments constitute a significant portion of the economic capital utilized by the firm. The high correlation implies that investors do reward those firms that heavily invest in R&D and innovation.

However, we wanted a metric to gauge the economic benefits of the output of those investments that correlates with the MVA that investors award to a firm. We examined the impact on MVA from a

number of operational factors within the control of each firm. By comparing changes in operational factors to changes in MVA, we developed an understanding of which factors strongly influence MVA. We found that MVA for pharmaceutical companies is strongly linked to their ability to rejuvenate revenue through the introduction of new products. In fact, those firms with the highest levels of revenue replenishment tended to be in the upper-right quadrant of the graph.

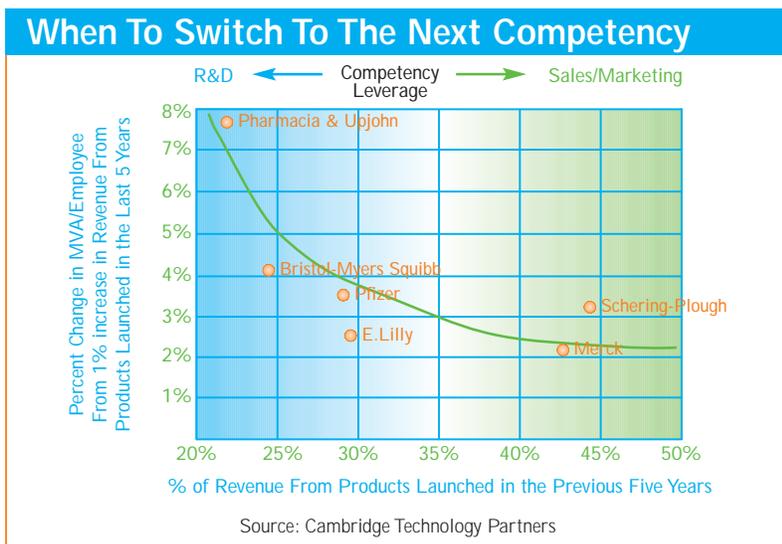
This linkage between new product revenue and MVA is entirely logical. The goal of R&D investments is to prime the product pipeline; therefore, successful R&D investment should result in continually refreshed product revenue streams. Working with 1997 industry data, we have determined that the MVA for pharmaceutical firms has a direct correlation to the rate at which revenues can be rejuvenated through the introduction of new products. For these purposes, we considered revenue from products that were five years old or younger to be "new revenue." We employed a five-year threshold based on expected product life cycles and rates of competition and substitution experienced by the industry. In general, pharmaceuticals that derive a

higher percentage of revenues from products that are five years old or younger have higher MVA/employee.

Similarly, revenue rejuvenation is strongly linked to the ability of these firms to invent, patent and commercialize new products. By examining the relationship of these operational activities to the rejuvenation of revenues, we have developed a method to predict the impact (or elasticity) on MVA/employee from an increase in the rate of innovation and commercialization of new products. This formula predicts that a 1% change in the amount of revenue derived from new products would produce the indicated change in MVA/employee for each of the firms given their existing percentage of

new revenues.

Next, we plotted the predicted change in MVA from a 1% change in new product revenues. The graph portrays the elasticity that exists between MVA/employee and changes in new product revenue. The potential increase in MVA/employee diminishes as the existing percentage of new product revenues increases. Consequently, the opportunity for firms like Merck & Co., Inc. and Schering-Plough Corp. to experience increases in MVA/employee is substantially less than it might be for firms such as Pharmacia & Upjohn, Inc. and Bristol-Myers Squibb Co. ■



(continued from p.15).

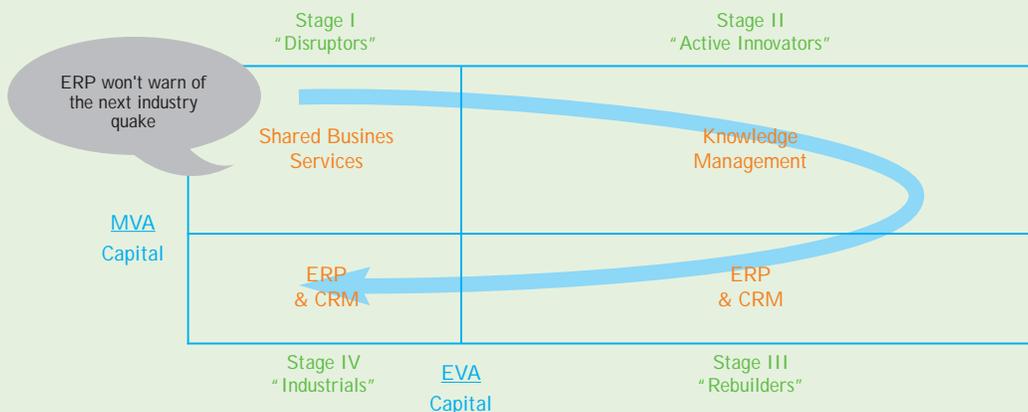
- The software industry creates the ultimate intangible. You don't actually buy software – you pay for the right to use the software. Low production costs lead to huge margins and economic profits. This, in turn, results in substantial MVA for players like Microsoft. The same intellectual-capital dynamics apply to the professional-services industry.
- Pharmaceuticals add value by transforming research-intensive laboratory efforts into useful (and commercially viable) drugs. Patent protection allows monopolistic pricing, which

Does ERP Mean Stifled Innovation?

Is it a coincidence that firms in mature industries are more likely to focus on customer relationship management (CRM) and enterprise resource planning (ERP) applications? Or that firms focused on rapid innovation rely more on messaging and collaboration applications? Or that firms trying to reinvent their industries employ still-unproven information technologies? Probably not.

A quick scan of application portfolios of the industries that occupy the four quadrants, or stages, of the Innovation Lifecycle shows that where you're positioned says a lot about the types of information applications you're likely to be focused on.

Firms located in the "Disruptors" stage are experimenting with shared business services such as messaging. B2B, B2X, X2B and X2X are new types of applications that support new and emerging business models. Companies located in the "Active Innovators" stage often emphasize knowledge-management solutions. Enterprises in the "Industrials" and "Rebuilders" stages, such as insurance, banking, and telecom firms, may be tapping CRM to hone their customer relation. Or they may simply have exhausted their capacity to innovate.





ensures long-term profitability for successful drugs. This protection offsets the risk associated with development cycles that can be as long as 15 years.

- Innovations in consumer packaged goods center on brand management. They create economic profits (and investor value) by constantly refreshing, repackaging and extending product lines. The Coca-Cola Co., the second-highest MVA creator, excels at this.
- The high-technology sector exhibits the ability to quickly innovate in industries that are governed by Moore's Law and experience rapid shortening of product cycles. Think about Cisco Systems Inc. and Intel Corp.
- Led by Wal-Mart Stores Inc., the retail sector emphasizes both process innovation as well as significant amounts of data analysis to increase operational efficiencies.

The other quadrants of the chart bear examination. Most sectors in Stage III are undergoing structural transformations. As such, the sectors in this quadrant represent areas that are ripe for intermediaries to step in to facilitate transactions. In life insurance, Internet purchases will increasingly challenge the traditional agent. The pressure to restructure in the chemicals industry precipitated the formation of the Chemdex market exchange. By participating in e-markets, many of the players in these sectors could expand their served markets.

The "industrial" economy sectors are concentrated in Stage IV. These industries are falling behind on both the EVA and MVA fronts. Historically, these sectors reaped profits through leveraging economies of scale to produce commodities. Now industries such as financial services are experiencing the power of the Internet as a deconstruction catalyst. The integrated business models of the banking industry are rapidly unraveling. Customers can now surf to institutions anywhere on the globe to get the best deals. The challenge for many Stage III industries is to disentangle the informational, or knowledge, component of the commodity from the actual produc-

tion or delivery of the service.

Linking the Innovation Lifecycle to the Hierarchy

Mapping the EVA and MVA characteristics back to the innovation hierarchy yields some profound insights. First, the forces of EVA and MVA reach an equilibrium that straddles disruptive and incremental innovation. The implication is that incremental innovation is required to sustain your current business, while disruptive innovations are needed to renew your business. This calls for a



The forces of EVA and MVA reach an equilibrium that straddles disruptive and incremental innovation. The implication is that incremental innovation is required to sustain your current business, while disruptive innovations are needed to renew your business. This calls for a portfolio approach to managing innovation.

portfolio approach to managing innovation. Advanced techniques, such as real-options analysis, may be required to understand how to assess the aggregate potential of all your innovation initiatives.

Our research suggests that an "inflection point" occurs when the MVA-to-capital ratio reaches 1.4. Industries with a ratio above 1.4 focus on product or business model innovation. Those below this threshold tend to emphasize process innovations. (See sidebar: "Does ERP Mean Stifled Innovation?," p.18) Even when remaining economically profitable, process-centric industries begin to lose investor confidence, which leads to a decline in MVA.

The lesson here is that firms obsessed with streamlining process execution may improve short-term profitability while sacrificing long-term viability. As such, process-centric innovation should not be the primary focus of innovation. Viewed differently, emphasizing process innovation – such as manufacturing improvements, customer service or marketing – over all other forms of innovation is a harbinger that your firm – perhaps even your industry – is in decline.

Our analysis of value creation draws a clear delineation between an "old world" and "new world" of value creation. Industries that have historically built competencies around manufacturing

prosess and physical-asset utilization have hit the wall. They are either facing extinction (Stage IV) or radical restructuring (Stage III). Those that act as disruptive forces (Stage I) or excel at translating intellectual capital into innovative products (Stage II) are leading the charge to create shareholder value. This supports our belief that competing on brains and core competencies provides the means for value creation in the New Economy.

In the Case Study on pp. 16-17, we further test the hypothesis by examining the pharmaceutical industry. ■

Innovation Portfolios Balance EVA and Market Value

	Goal	Impact on Value	
		EVA	MVA
Disruptive Innovation	Reinvent Industry	↓	↑
	Reinvent Category	↓	↑
Incremental Innovation	Refine Product or Service	↑	↔
	Streamline Execution	↑	↓

Equilibrium

Source: Cambridge Technology Partners



Diagnosics:

Rating Your Innovation Capacity

Use this self-diagnostic to determine the health of your innovation effort.

A pragmatic first step to understanding your core competencies is to decompose your value chain into its major business processes. Next, you need to map the information and intellectual-capital resources required to perform each process step.

Which of these resources constitute areas where you have a defensible knowledge advantage over competitors?

The chart on p.22 – which is based, in part, on the work of economist James Brian Quinn – will help you arrive at a set of true core competencies, and a set of supporting competencies, as well as a set that would be better executed by partners. In the New Economy, each component of the value chain can be optimized through partnerships and alliances. This, in turn, increases the overall value delivered to customers.

Now, map your intellectual assets and knowledge advantages to the core competencies. Competencies in which you have a solid knowledge advantage are your sweet spot. This is where your firm truly creates value. Competencies where

you don't have a clear knowledge advantage are competitive vulnerabilities. There are two choices: to invest heavily to shore up these areas, or to partner strategically to fill the gaps.

Supporting competencies with a knowledge advantage also present two options.

First, they are a potential first line of defense when protecting your core competencies. Second, they are areas of expertise that you can offer to partners to strengthen your relationships. Finally, supporting competencies that yield no knowledge advantage represent areas where it's important to maintain the status quo.

Finally, see where your core competencies fall on the charts we've built throughout this paper. The matrices on pp.12-13 show the market-dominance goal that the competency supports. They also provide a rough cut at the mix of competency capital (intellectual, relationship, structural) that is required to successfully implement your competencies.

In addition, the grid on p.20 indicates the relative impact of each competency on

economic profitability (EVA) and long-term viability (MVA). For example, the design-and-development competency supports the goal of maintaining market dominance through incremental product enhancements. It requires a balanced mix of intellectual, relationship and structural capital (see chart on p.13). Economic profitability should be improved, while MVA levels are sustained.

The matrices can also help identify potential competency gaps. For example, suppose your firm fits the profile of an incremental product innovator. You believe that the introduction of new technologies could upset your current market, so you decide to add some disruptive product-innovator initiatives to your innovation portfolio. Using the matrices, you will need to add more research expertise, most likely through partnership (there's no time to grow it yourself.)

Required investments may mean a negative hit on short-term profitability (EVA). Yet, if successful, your MVA will improve.

Next Steps

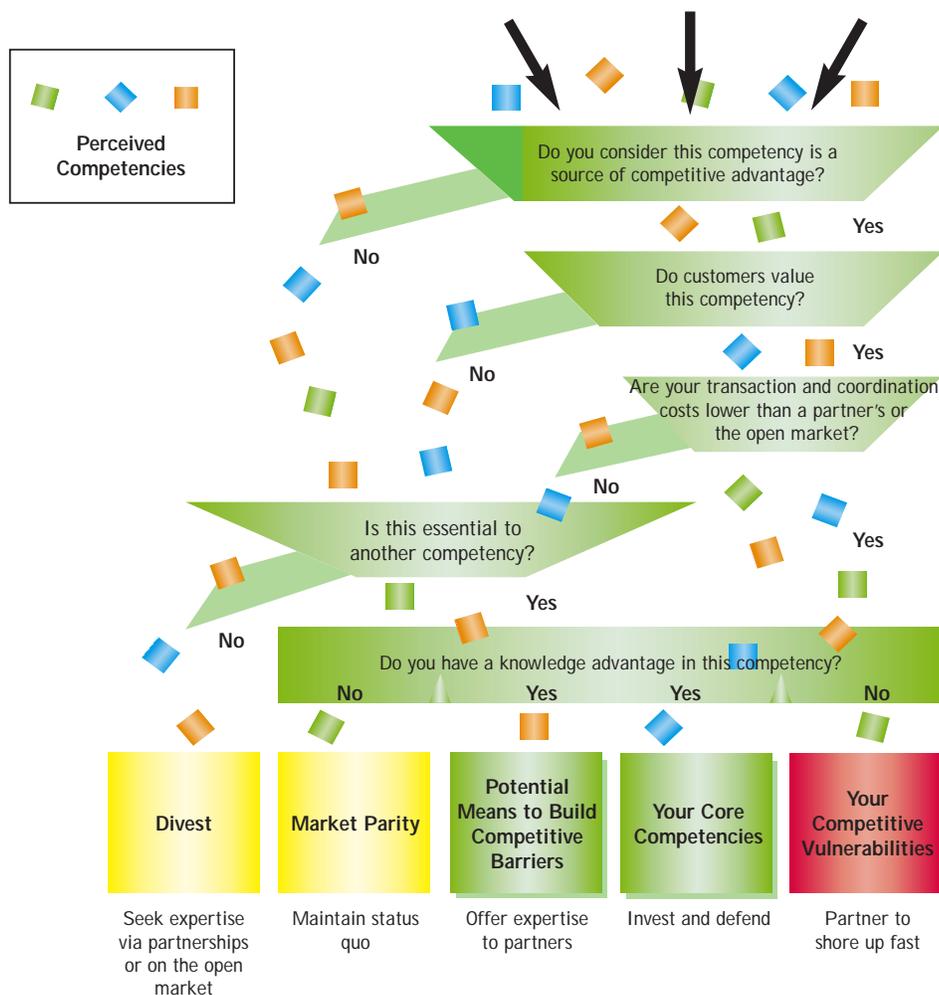
Understanding the linkages between innovation and value creation is essential

to understanding where your company begins and ends in the networked economy. To succeed in this environment, you'll need to take a long, hard look in the corporate mirror and honestly assess the unique competencies your firm possesses.

Know these core competencies and you'll be able to determine where you add value in the networked economy. Using the frameworks presented in this paper, you will be able to decide which competencies to invest in. You also be able to anticipate

the impact of these decisions on short-term economic profitability – and the long-term survival of your company. ■

A Tool For Determining Necessary Competencies



Source: Cambridge Technology Partners



Further Browsing:

Sources And References

"The Discipline of Market Leaders"

Michael Treacy and Fred Wiersema, Addison-Wesley Publishing Company, 1995

"The Sixth Extinction: Patterns of Life and the Future of Human Kind"

Richard Leakey and Roger Lewin, Doubleday Books, 1995

"The Victorian Internet : The Remarkable Story of the Telegraph and the Nineteenth Century's On-Line Pioneers"

Tom Standage, Walker & Co., 1998

"The Diversity of Life"

Edward O. Wilson, Belknap Press, 1992

"The New Economy Primer"

John Kerr, Kirk Klasson, Cambridge Technology Partners, June 1999

"The Innovator's Dilemma"

Clayton M. Christensen, Harvard Business School Press, 1997

"Increasing Returns and the New World of Business"

W. Brian Arthur, Harvard Business Review, July-August 1996

"An Interview with Paul M. Romer"

Joel Kurtzman, Strategy and Business, First Quarter 1997

"How a Firm's Capabilities Affect Boundary Decisions"

Jay B. Barney, Sloan Management Review, Spring 1999

"Introducing the Value Creation Index"

Geoff Baum, Chris Ittner, David Larcker, Jonathan Low, Tony Siesfeld and Michael S. Malone, Forbes ASAP, April 3, 2000

"Identifying 'Super-Technology' Industries"

John W. Medcof, Research Technology Management, July 1999

"Strategic Outsourcing: Leveraging Knowledge Capabilities"

James Brian Quinn, Sloan Management Review, Summer 1999

Other White Papers

In The New Economy Series

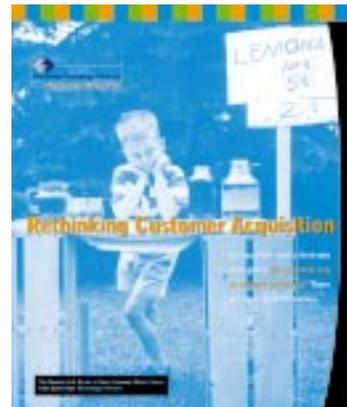
New Economy Primer

No business will be untouched by the New Economy. It will affect the way in which your organization must interact with customers, suppliers, and employees, and it may provoke alliances with competitors and with temporary partners whose value-added you can't yet imagine. In this white paper, the first in the New Economy series from Cambridge Technology Partners, the New Economy is defined and characterized in ways that prompt businesses to gauge their vulnerability in the new competitive environment and encourage them to imagine themselves as New Economy success stories. ■



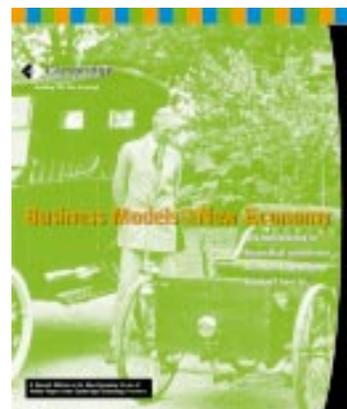
Rethinking Customer Acquisition

The Web is commonly viewed as an ideal mechanism for acquiring customers, especially when compared with proven but costly approaches such as advertising and direct mail. And many are enchanted with the ease with which it scales to reach more prospects. But in a medium where business models are evolving faster than the technology they're built upon, e-markets – electronic mosaics of buyers and sellers – often prove much more effective at driving the right new customers in your direction. Learn more in Rethinking Customer Acquisition, the second in the New Economy series from Cambridge Technology Partners. ■



Business Models for the New Economy

We've lived so long with the "vertical" organizational structure – the hierarchical business model – that it would be reasonable to assume it's irreplaceable. Not so. Now that the Internet is encouraging a natural selection of organization forms into specialized value-producing and value-exchanging entities, networks and e-markets become highly effective alternatives. So should your organization be structured differently? Find out in Business Models for the New Economy, a special edition in the New Economy series from Cambridge Technology Partners. ■





Notes:





Cambridge Technology Partners provides management consulting and systems integration services to transform its clients into e-Businesses. Working in collaboration with Global 1000, high-velocity middle market companies and dot-com companies, Cambridge combines a deep understanding of New Economy issues with integrated, end-to-end services, and a proven track record of shared risk and rapid, guaranteed delivery. Cambridge generated \$628.1 million in revenue in 1999, with \$243.3 million from its global e-Business solutions. Cambridge has approximately 4,000 employees and 53 offices worldwide. Cambridge is a Safeguard Scientifics (NYSE: SFE) partner company.

Cambridge on the Web: ctp.com

Creating Value Through Innovation staff:

Authors: Bob Flanagan, Kirk Klasson

Editor: John Kerr

Designer: Amanda Baldrige

Copy Editor: Paul Hoffman

the 1990s, the number of people in the world who are illiterate has increased from 1.2 billion to 1.5 billion. The number of illiterate people in the world is expected to increase to 1.8 billion by the year 2015 (UNESCO 2003).

There are a number of reasons for the increase in illiteracy. One of the main reasons is the rapid population growth in the developing world. Another reason is the lack of access to education, particularly in rural areas. A third reason is the high cost of education, which is often beyond the reach of many people. Finally, the quality of education is often poor, leading to high dropout rates and low levels of literacy.

The consequences of illiteracy are far-reaching. Illiterate people are often unable to find work, and they are more likely to live in poverty. They are also more vulnerable to exploitation and abuse. In addition, illiteracy hinders the development of a country, as it prevents people from participating in the economy and society.

There are a number of ways to reduce illiteracy. One of the most important is to improve access to education, particularly in rural areas. This can be done by building schools and providing transportation. Another way is to reduce the cost of education, for example by providing free textbooks and uniforms. Finally, it is important to improve the quality of education, so that people are able to learn and retain what they have learned.

Reducing illiteracy is a challenge, but it is one that must be met if we are to achieve the goal of universal education. It is a goal that is essential for the development of a better world for all.

References

- UNESCO (2003) *Global Education Trends*. Paris: UNESCO.
- World Bank (2003) *World Development Report 2003: Women's Empowerment and Economic Development*. Washington, DC: World Bank.
- World Bank (2004) *World Development Report 2004: Making the Most of Human Development*. Washington, DC: World Bank.
- World Bank (2005) *World Development Report 2005: Gender and Development: Making the Difference*. Washington, DC: World Bank.
- World Bank (2006) *World Development Report 2006: Education for All: Meeting Basic Learning Needs*. Washington, DC: World Bank.
- World Bank (2007) *World Development Report 2007: The Innovation and Entrepreneurship Agenda*. Washington, DC: World Bank.
- World Bank (2008) *World Development Report 2008: Financing for Development*. Washington, DC: World Bank.
- World Bank (2009) *World Development Report 2009: Access to Basic Services*. Washington, DC: World Bank.
- World Bank (2010) *World Development Report 2010: Development in a Changing World*. Washington, DC: World Bank.
- World Bank (2011) *World Development Report 2011: Learning to Realize the Dream*. Washington, DC: World Bank.
- World Bank (2012) *World Development Report 2012: Gender Equality and Empowerment*. Washington, DC: World Bank.
- World Bank (2013) *World Development Report 2013: Jobs for the Future*. Washington, DC: World Bank.
- World Bank (2014) *World Development Report 2014: Innovation and Entrepreneurship*. Washington, DC: World Bank.
- World Bank (2015) *World Development Report 2015: Youth 2015: Opportunities and Challenges*. Washington, DC: World Bank.
- World Bank (2016) *World Development Report 2016: Digital Dividends*. Washington, DC: World Bank.
- World Bank (2017) *World Development Report 2017: Employment*. Washington, DC: World Bank.
- World Bank (2018) *World Development Report 2018: Learning to Realize the Dream*. Washington, DC: World Bank.
- World Bank (2019) *World Development Report 2019: The State of the World 2019*. Washington, DC: World Bank.
- World Bank (2020) *World Development Report 2020: The Role of Digital Technology in Economic Growth*. Washington, DC: World Bank.
- World Bank (2021) *World Development Report 2021: The State of the World 2021*. Washington, DC: World Bank.



8 Cambridge Center
Cambridge, MA 02142
Phone: 617.374.9800
Fax: 617.914.8300
ctp.com

Sept.2000
127.1000
© by Cambridge Technology Partners