

Failed Paradigms of Financial Analysis: Sunk Costs

The first of a two-part series explores how not accounting for sunk or fixed costs can shackle incumbents' innovation

BY CLAYTON M. CHRISTENSEN

In a 1962 commencement address at Yale University, John F. Kennedy spoke of the danger of blindly relying on accepted paradigms, saying: "For the great enemy of truth is very often not the lie—deliberate, contrived and dishonest—but the myth—persistent, persuasive, and unrealistic. Too often we hold fast to the clichés of our forebears. We subject all facts to a prefabricated set of interpretations. We enjoy the comfort of opinion without the discomfort of thought."

How does this relate to innovation and the difficulties firms face in consistently sustaining success over long periods of time? In most cases, firms fail at innovation not because of managerial ineptitude or organizational complacency, but because they are relying on outmoded or inappropriate theories and accepted norms of what constitutes "good business."

Over the years, we have identified a number of such traps that can impede a company's innovation efforts. The admonition to always satisfy your best customers tends to make it difficult to see the future impact of disruptions on a core business; traditional customer- and product-segmentation tools often lead to innovations that fail to address meaningful, under-served customer jobs; and the human resource bias to put experienced managers whose competence you've learned to trust in deliver-

How the U.S. Army Got Game

Seemingly trivial innovations can have a major effect on even large markets

BY MICHAEL URLOCKER & ROGER SMITH

Apple Inc. CEO Steve Jobs is famous for his flashy, headline-making introductions of innovative new products. While the iPod, and more recently the iPhone, generated a great deal of publicity right from the outset, many innovations are hardly noticed at first.

In fact, often seemingly trivial developments can be harbingers of big change. When a small, regional airline began operating out of Dallas's Love Air Field, no one foresaw that Southwest Airlines would fundamentally alter air travel. And when a guy started selling Pez can-

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Voices of Disruption

RICHARD N. FOSTER

This issue we feature the first of a two-part series with Richard N. Foster, the managing partner of Investment & Advisory Services, LLC, and a member of Innosight's board of directors. He is the author of two best-selling books on innovation: *Innovation: The Attacker's Advantage* (1986) and *Creative Destruction* (2001).

When did you begin your work on innovation?

I've been toiling in these vineyards since the late 1970s. I've been around these fields for a long time. In the early stage of my career I was trying to get after the nexus of technological change and economics. How did that work and how did companies invent successful products? My findings were captured in my 1986 book *The Attacker's Advantage*. My second book, *Creative Destruction*, contemplates what all of those findings mean for investors.

What are your findings?

What you find is that the normal,

implicit notions in our society—that there are exceptional companies, that there's a magic method, that there is *a way* for companies to do things—are untrue. I don't think there's any “way,” any immutable rules for business success.

Markets are quite adaptable, adaptive, and adapting. And what that means is something that worked last time is probably not going to work this time or the next time. The market learned from the past and adapted.

Think of an analogy. If you were a master chess player in 1890 and came back today, you would not even be one of the top 10,000 players. Players have learned from the

past and adapted. That's the way business is, too.

So to write the definitive, lasting work on chess in 1890 would have been impossible, unless the principles were so vague that they had no specific meaning: “Think hard,” or something like that. And that's my view of business literature, by and large. This is a constantly evolving game and the rules are constantly evolving. So, please, don't rely on a book that claims to have a list of business “rules” that don't ever change.



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How does the market adaptability you describe impact incumbents and entrants?

Back in 1986, almost all CEOs felt that the rules of business favored the defenders. The thinking was that it was much easier once you had a market position to defend it than to attack it. My research at that time indicated that this just was not true.

If you look at companies one-by-one it may be true, but there is never just one attacker. There is a cohort of them. There were 1,000 companies that came into the electronics business and probably 600 entered the automotive business. It's those hordes that established companies have to worry about.

If you ask what the probability of success of any one attacker is, it is diminishingly small. If you ask what the probability of the entire horde failing is, it's even smaller. The horde will be successful. It's very difficult to predict *who* in the horde will be successful, but you can predict the horde will be and, therefore, that the defender will lose. That's a predictable bet.

What can established companies do to combat these threats?

In *Creative Destruction*, we talk about how there is no all-wise, all-knowing company. Executives need to accept this notion. Even General Electric (GE), if you take its results over a very long period of time, does not substantially outperform the S&P 500. Why? Because the S&P is constantly changing.

New, growing companies enter the index, while others exit the index. So, the only way a company can match the S&P over time is by constantly changing. And the only way investors can outperform the market is by trading at a faster rate than the S&P.

So I believe that companies need to develop the ability to change at the pace and scale of the markets. And that led me to a model of the corporation that is not an operate-and-control model, which is what 99 percent of business and business education is about. What I advocate is a "create-operate-trade" model.

First you have to create businesses and I'm indifferent as to whether a company grows or buys these businesses. And then you operate the heck out of them. For example, Johnson & Johnson (J&J) acquires new businesses and then brings

a global distribution system that vastly reduces costs for the acquired companies.

Then, as time goes on and circumstances change, companies have to trade these businesses. They sell them. And that's not a measure of failure; it's a measure of where these companies are in their economic cycle. And these companies often do quite well. As a matter of fact, if you look at many of J&J's divestitures, they are doing very well—and much better than they could have done as a part of J&J.

What becomes of the companies that are "traded"?

These companies are still cash generating, but it's important to realize that not every company should grow. This is a statement I've had a great deal of difficulty getting many top CEOs to accept.

In some mature businesses, the objective should be to run the company for cash and, therefore, not grow. You want to make cash and spin that cash back to the market where it can be invested in new things that *can* grow.

For example, you're not going to get guys that are running a titanium dioxide factory to write breakthrough software. It's just isn't going to work. The marketplace has to do that.

It is worth noting that it is quite a difficult task to manage a corporation that is not growing. Managers are faced with an array of career issues and it is challenging to retain employees and find new employees to bring into a company that is not growing and is not planning to grow. These are very difficult issues that require a specific set of

skills. It's not necessarily the most exciting business to operate, but it's much better than wasting all of that cash.

How does trading improve companies' innovation efforts?

Creation and innovation are one part of the create-operate-control troika, but not the only part. Operating and trading are also part of the process. My view is also that unless you trade you can't create.

Without trading, you get so concerned with operating existing business that are moribund relative to your objectives that you have no time to do the difficult work of creating and starting new business. If you are going to create, you must trade. And trading in a profitable way is quite a challenge.

But if you look at the patterns of GE or J&J or Time Warner or any great company, you will find they have a history not only of acquiring the businesses that we all hear about, but of divesting businesses, as well. J&J divests about one business for every two it acquires. In Jack Welch's first three years at GE, he divested around 130 companies. I think Jeff Immelt has divested \$80-\$90 billion in sales since he's taken over GE.

Trading gives companies room to innovate. And this need to trade fits nicely with the work of Clayton Christensen and Innosight. Trading allows companies to see beyond their core markets and to find opportunities for the new growth that is so essential to overcoming the innovator's dilemma. ♦

Next Issue: How these models can apply to upstart companies and developing countries.

Innovators' Update: Software Disruptors March On

Have SAP and Oracle been able to reach nonconsumers to respond to the disruptive growth of Salesforce.com?

Each issue, we'll take a look back at a past Innovators' Insight to see how our analysis has held up. In this issue, we look at Insight #56, "SAP's Foray Into Disruption" The insight suggested that SAP and other software providers best chances of responding to disruptive developments was to introduce solutions that targeted nonconsumers of existing solutions. What has happened since?

Salesforce.com CEO Mark Benioff loves to rile large incumbents by touting how difficult it will be for companies like SAP and Oracle to respond to his company's Internet-delivered offering. He believes that his low-priced, flexible customer-relationship-management solution is incompatible with incumbent business models based on integration and customization.

Benioff is targeting two large, well-run companies. Both clearly recognize that Salesforce.com's model requires a response, yet both are struggling to get this right. While the overall software market is growing, the titans appear to have stagnated: Both recently reported disappointing financial results.

Part of this is just the law of large numbers. Big companies need to produce much more revenue to grow at the same rate as small ones. Oracle, for example, has about \$3 billion in revenue. To grow 20 percent next year, it essentially needs to create growth equivalent to *all* of Salesforce.com's 2006 revenues.

Another problem: Incumbents have an overwhelming tendency to force-fit a disruption to their market. For example, SAP is trying to make its core product more flexible and adaptable. If it succeeds, it will have the best of both worlds—high powered, flexible software. Of

course, adapting existing solutions that are tightly intertwined with other packages and processes is no small order. Getting current customers to migrate to the new architecture requires time and attention.

A far better approach involves seeking out nonconsumers, for whom switching costs aren't an issue. This path isn't an easy one; it requires incumbents to utilize entirely new approaches.

SAP seems to have recognized the need to find new ways to serve the small businesses that historically found its software too complicated—and too expensive. It has publicly acknowledged that it needs to change its business model and to find new ways to reach nonconsumers. (*Editor's note: SAP and Insight have worked together to research business model innovation.*)

One warning sign: A recent *Wall Street Journal* article said the company would spend as much as \$500 million to develop a "simple" offering for small businesses.

The price tag seems high, raising fears that SAP is over-engineering its solution. The best way to crack into new markets is to approach the problem like an entrepreneur, forcing scarcity on teams to encourage simplicity and creativity. Spending too much can lead to needless pursuit of perfection when "good

enough" solutions are acceptable.

Nonconsuming opportunities tend to start small. After all, Salesforce.com's first-year revenues were a whopping \$5.4 million, a trivial figure to a multi-billion dollar incumbent. The higher the investment, the more impatient companies are for growth. Companies can prematurely pull the plug on great long-term opportunities that aren't getting big enough, fast enough to make the numbers work.

While the giants struggle to respond to Salesforce.com, the disruptive attacker is constantly seeking to extend its business model. Salesforce.com recently launched "AppExchange," an online offering that allows customers to find on-demand, third-party-produced add-ons that seamlessly plug into Salesforce.com's infrastructure.

At first, it might seem counterintuitive for Salesforce.com to allow potential competitors to reach its customers. However, its innovative approach has several benefits:

- It further showcases the value of software as a service.
- It allows Salesforce.com to use its reach to serve as a market-maker for smaller software providers.
- It allows Salesforce.com to gain important insight into features its clients demand.
- It could provide early insight into good acquisition targets.

The battle is certainly not over. But as long as the titans try to force disruptive approaches onto existing markets or fail to reach nonconsumers, Salesforce.com looks well positioned to continue to drive its disruptive stake deeper into the heart of the industry leaders. ♦

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dy dispensers on an obscure website, few imagined the impact eBay would come to have on a variety of industries.

These stories of course are well-known to most everyone now, but few people are aware of an apparently insignificant event in 1995 that fits the disruptive pattern we've seen before. Working on a shoestring budget, a U.S. Marine Corps lieutenant and a sergeant had a radical idea: To try to alter the popular "Doom" video game, in which players use a variety of weapons to fight electronic foes, for use as a military training tool.

The result was "Marine Doom," a (by today's standards) rather simple video game that could be used to teach soldiers certain skills at a low cost. The developers were hoping to find a way to boost training in an era of significant budget cuts and came up with a cheap, simple, and convenient—in other words disruptive—solution.

Yet, in spite of all of its benefits—and considerable media attention at the time—Marine Doom failed to take off because it did not meet the military's high standards. The story of why this first effort was unable to gain traction and how in the intervening years gaming has grown into a valuable training tool offers meaningful insights into how small disruptions can ultimately make a big impact.

A failed first foray and a successful second effort

Much like the minicomputer industry's reaction to early personal computers, many in the military brass considered Marine Doom and other early training games

distractions from the real work of developing and using traditional multi-million dollar simulation systems to train soldiers.

Although weapons-related games and soldiering would seem like a natural combination, the deployment of games as a serious military training tool has been anything but simple. These low-cost technologies were attempting to disrupt a decades-old, monolithic defense industry that was well entrenched in the purchase processes of the military.

Simply put, using consumer-level PCs and video game technology seemed all wrong when seen through the traditional ways of training soldiers. Historically, the military had two main ways of training soldiers. The first involved instructor-led classroom and field activities that put soldiers through combat-like situations.

The military did embrace technology-based training as well, but this involved the use of immersive simulators that were akin to flight simulators used in the aerospace industry. Such simulators weighed thousands of pounds (essentially reproducing the interior of a tank, for example) and had custom hardware shells made of military-grade materials. They cost a minimum of \$400,000 and could simulate only a single battlefield function, such as advanced gunnery training. In this context, video games seemed much too simplistic for military use.

While the chain of command did not embrace gaming, it did not kill it entirely. Faced in 2000 with record low recruiting numbers, the Army turned to gaming to help attract new recruits. America's

Army Game, an online video game developed internally that relied on the Unreal game engine created by Epic Games Inc., took center stage in the effort.

The game attempts to simulate the experience of an Army soldier by allowing users to play out a variety of scenarios. Instead of just containing fight scenes, the game tries to educate users about the Army and the various career paths different soldiers can take. Unlike most war-based video games that emphasize killing enemies, America's Army awards points for factors such as teamwork, responsibility, and good values—traits the Army deems essential.

The goal of America's Army was to attract young men and women to their local recruiting offices. It was a hit. Enrollment went up, hundreds of thousands of people downloaded the game, and the effort became a public relations sensation for the Army.

Why did military leaders embrace America's Army but shun Marine Doom? America's Army targeted a "foothold" market with much less rigorous standards for acceptance than had Marine Doom. Preparing soldiers for battle is a core function of the military: Any mistakes would have major consequences. This meant that new training tools had to meet extremely high internal standards.

America's Army, on the other hand, was just a marketing tool. If the product flopped, no lives would be lost and, while recruitment might not get a boost, it was unlikely to plummet either. As such, the project and the final product did not receive the same

level of scrutiny from the Army's most demanding users. Like most successful disruptions, this allowed the project to launch and build quickly, identify elements that were successful, and retool as needed.

Having secured a foothold, gaming moves upmarket

The success of America's Army spawned a renewed interest in military gaming and the technology mushroomed into dozens of new training applications. A number of Army organizations began to invest in their own game-based tools, creating training systems for things like learning how to control robots, use new rifles, steer remote-control machine guns, and convey basic "Army 101" information.

The legendary Defense Advanced Research Projects Agency (DARPA), the technology research arm of the Department of Defense that developed the progenitor of the Internet, began working on gaming applications, in some cases in conjunction with private companies. DARPA focused on identifying ways to cheaply and easily adapt commercially available games to meet specific military training needs.

Today, the Army is continuously identifying new opportunities to expand the role of gaming technologies in simulation and training. The long-term goal is to work with smaller commercial gaming system manufacturers and commercial software developers to create new individualized training systems for

all soldiers. To get there, the Army is redefining how it trains and educates—and thousands of existing processes and technologies could be disrupted.

One of the biggest successes is *Ambush!*, a computer simulation game now used in the field by the Army. (Images on this page and the following page show virtual scenes from this game.) *Ambush!* trains soldiers how to extricate themselves from the deadly confrontations that occur so regularly



A scene from the U.S. Army's *Ambush!* video game-based training tool

in parts of Afghanistan that some coalition troops have nicknamed of the main highways in Afghanistan Ambush Alley.

As with most successful disruptions, a number of outside factors contributed to the successful adoption of gaming by the military.

Ongoing improvement: In the early years, available games were so simplistic that many people could not imagine using the technology in demanding military contexts. The development of the Unreal game engine and other technologies have allowed richer levels of detail and larger battlefield maps, making simulation games far more realistic and scaleable than the earlier Doom-based games.

Shifting context: The nature of the military challenges faced by the Army has changed from a World War scenario in which large forces of thousands of soldiers are mobilized across countries to more fragmented battles in which a few dozen soldiers fight enemies from one street corner to the next. Current gaming technology is better suited to simulating this environment than are the incumbent systems that create single, large-scale battle scenarios.

Changing needs:

To respond to current situations, soldiers require individualized training, whether it is teaching a medic how to evacuate a fallen soldier from a street, training an interpreter how to interact with local leaders, or teaching a convoy driver how to spot a potential

ambush. Most traditional Army training has tended to emphasize widely used skills, not the customized learning these new technologies enable.

Three lessons from the Army's adoption of gaming technology

The growth of low-cost gaming technologies in the Army offers a number of lessons about how successful disruptions can take hold and continue to grow.

Flexibility enables disruptive success

Relative to existing military simulators and training tools, video games are simple and low cost. At first, this made the offerings poorly suited to accomplishing the highly

demanding and important job of preparing soldiers for battle.

But some in the military did see potential applications and exploited the flexible nature of the innovation to suit a different, less demanding niche: recruiting. Once gaming had significant success in one area, innovators were able to build on this to move into more demanding tiers.

The flexible nature of gaming technologies is altering industries well beyond the military. Linden Labs's Second Life, a self-described "online society within a 3D world, where users can explore, build, socialize, and participate in their own economy," began as an advanced social network where people could use avatars to interact and make virtual transactions online.

For its first couple of years, Second Life predominantly attracted individuals who wanted a fun place to interact online and did not demand top-end functionality. Because the virtual environment was incredibly flexible, Second Life was able to dramatically improve over time, refining features users liked, squashing those they did not, and providing greater graphics and memory capability.

Now, demanding corporate marketing departments have found numerous uses for the newest version of Second Life. Starwood Hotels is premiering its newest property brand, named "aloft," in the online universe, including undertaking a virtual construction of a marquee building. Dell Computer sells actual PCs through the virtual store, while Toyota allows users to buy

virtual versions of its Scion xB to users who want to drive their avatars around the Second Life universe. And finally, both rounding out and summing up the potential of gaming, IBM had a virtual meeting in Second Life to discuss the effects of multiplayer games can have on businesses.

Disruptive innovations come from disruptive suppliers

The Army struggled with this lesson because it had been well served by large, incumbent suppliers for decades. In the past, these



Ambush! allows soldiers to train for a wide variety of situations, including convoy formations shown above

suppliers were able to anticipate the military's needs and deliver cutting-edge, innovative solutions.

But, just as the Army failed to recognize the full value of games as training tools early on, traditional suppliers of military training and simulation systems failed to recognize the changing needs of the Army itself.

For example, one of the great advantages of new PC-based game systems is the high level of detail they offer, which is valuable in simulating street-to-street combat. But established projects and investments in technology prevented

existing contractors from creating these newer and higher fidelity tools.

Why? First off, existing providers were raking in handsome revenues from improving existing technologies and products, which the military gladly purchased. These simulators were high-margin, enormous machines that demanded precise manufacturing. Video games, on the other hand, are lower margin pieces of software that can be produced much more cheaply. To succeed in such a different market, an incumbent would have to organize itself entirely differently and learn new skills—not an easy task.

In contrast, computer game developers had been cranking up their ability to deliver high fidelity at a low cost for years. These companies are naturally inclined to recognize that high levels of detail are crucial in new types of simulations—it's the same attribute of performance that gamers in the consumer market have been demanding for decades.

Although it may seem surprising that the entertainment industry should be a source of technological innovation for the Army, it is worth recognizing that computer games have become a major industry, with annual sales approaching \$50 billion.

Innovative organizations evolve

When Marine Doom launched, the Army failed to see and build upon the (to some) obvious potential gaming held to improve and lower the cost of training. One reason for this was that senior leaders simply did not understand the po-

tential of the new technology. They were accustomed to purchasing expensive, complex systems that had undergone rigorous analysis, not doctored versions of video games played by teenagers.

What could they have done differently? They could have tried to learn more from the people who were embracing the disruptive technology early on. Soldiers themselves were a great early indicator of the value of the innovation. They were naturally inclined to use games as a training tool because they had grown up playing such video games.

The early success of Marine Doom was a signal of change, but this signal was not properly interpreted. It was seen as a distraction from the main business of training and simulation, not as an early prototype that could be embraced, tested, refined, and built upon.

Additionally, the military, like many large organizations, was hindered by an overly complex purchasing system and a reliance on traditional suppliers. Although the Army has tried over the years to court new suppliers, it has been unable to draw a lot of small, disruptive partners for one main reason: The Army is a complex customer for which to work.

Smaller companies focused on game technology frequently concluded that the Army was either unwilling or unable to work with them. Decisions were made too slowly for the smaller companies' sales cycles and Army brass were unprepared to make significant commitments.

Suppliers, of course, must always do their best to adapt to the needs of important customers, but organizations seeking disruptive solutions need to do more than

just express interest in streamlining their acquisition process.

Within this tension, there is clearly a role to be played by suppliers with a mastery of the disruptive game technologies and a culture of understanding and dealing with complex acquisition processes.

Disruptive forces are unfolding all around America's armed forces. The nature of world threats has changed and the technologies for dealing with those are changing as well. The emergence of game technologies as alternatives to many of the established tools for training is just one of the disruptions that is forcing the Army to adapt to the needs of the 21st century. ♦

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Year in Preview: Disruptive Trends to Watch in 2007

The disruptive innovation models can help you look forward, not just backward

BY SCOTT D. ANTHONY

Some doubters claim that the disruptive innovation models only provide insight in hindsight. We disagree. We believe that the disruptive innovation models can help to illuminate market trends well before they reach the mainstream, allowing analysts and strategists to interpret even the faintest signals with far greater confidence.

While the future can't be perfectly predicted, there are a number of developments with high disruptive potential that we anticipate will begin having meaningful impact in the near future. This article presents an analysis of four developments we'll be watching closely this year and offer an accompanying list of some other trends to watch in 2007.

Fights for control of the 'third screen'

The last 10 years has seen substantial change in the media industry as traditional giants have had to contend with seemingly endless waves of attackers. Advertising dollars—the key revenue source for most traditional media players—have increasingly skated from incumbents to emerging Internet players like Google and Yahoo!.

OTHER DISRUPTIONS TO WATCH

Disruptive sneakers

Basketball star Stephon Marbury has introduced a line of \$15 sneakers to compete against the high-end sneakers sold by Nike and Reebok. While this dramatically lower price certainly makes high-end shoes more affordable, one of the “jobs” for which teenagers hire shoes is to project a particular image, one not often associated with severe discounting. If, however, Marbury’s star power is enough to get the important job of projecting a “cool” image done, then his line of sneakers could be the first of a series of disruptive attackers in markets whose high prices support bloated marketing budgets.

The \$100 computer, a technology seeking a problem?

For years, technologists have been pinning for an affordable computer that could reach the hundreds of millions of poor people in the developing world. Two teams have developed ingenious ways to develop cheap, “good enough” computers. There’s just one problem with the \$100 laptop: It isn’t clear whether or not the target consumer has any problems for which the \$100 laptop is a good solution. The \$100 computer might end up being a nifty technological development that has minimal market impact.

Netflix takes the next step

Poor Blockbuster. After years of fits and starts, it finally developed a model that might be a viable competitor to Netflix’s booming online DVD-rental business. Blockbuster’s play involves allowing consumers to pick up or drop off videos either online or at one of Blockbuster’s thousands of rental stores. Blockbuster’s salvo

Internet players haven’t simply copied traditional business models to snatch advertising dollars. Instead, the companies have pioneered approaches like search-based advertising (tying advertisements to search terms), lead generation (where advertisers only pay when they receive qualified leads), and email-based marketing efforts.

There is a widely held consensus that the so-called “third screen”—mobile phones—is the next frontier in the battle for advertising dollars (the first and second screen are television and computers, respectively). As Peter Chernin, the president and COO of News Corp., put it, “Mobile is the largest distribution platform on earth. There are two billion cell phone users, versus one billion Internet users and one billion television users.”

If history is any guide, the winner of the battle for the third screen will introduce a new business model to exploit this opportunity. The most obvious option is opt-in, permission-based advertising that is tied to a user’s location or activities.

For example, if you’ve expressed an interest in learning about sales on electronics equipment, electronics stores will pay to be able to send customized ads or coupons to your phone when you are passing one of their stores.

While such offerings are beginning to be rolled out, it is entirely possible that the winning model has yet to be imagined. While companies will make money with small banner ads and text messages, the development of a new business model will herald true disruptive change.

Air taxis begin to soar, but high-end airlines falter

We have been touting the disruptive potential of air taxis for several years. A host of manufacturers are getting close to commercializing planes that could enable the air taxi revolution, but service providers still must address vexing business model issues.

A number of manufacturers have entered the fray, ranging from startups like Adam Aircraft and Eclipse Aviation to established players like Embraer and Cessna. These companies are aiming to produce relatively inexpensive, small, fuel-efficient jets. Dubbed “Very Light Jets” (VLJs), these planes can cost effectively carry a handful of passengers hundreds of miles.

While the creation of affordable planes is a key enabler of a viable air taxi industry, it is not enough. The other piece of the puzzle is a service model that profitably takes advantage of the availability of these new class of jets.

The fractional jet industry, where owners pay for the right to use a small jet for a certain number of hours per year, is an illustrative example. While providers such as NetJet and Flexjet have been growing, these companies haven’t figured out how to actually make money. The basic problem is capacity utilization. Too frequently, an empty plane has to fly to pick up a fractional jet owner. Frequent, empty flights leads to an unprofitable business model.

One emerging air taxi provider—DayJet—is attempting to solve this problem. The company was founded by Ed Iaccobucci, the founder and CEO of enter-

prise software company Citrix. Iacobucci's vision is to develop algorithms and pricing models that maximize his fleet's capacity utilization. If the utilization problem cannot be solved, expect many of the emerging air taxi providers to grow their top line quickly but collapse under the weight of a flawed business model.

Another recent development in the aviation industry is the emergence of companies like Eos and MAXJet that offer business-class only service on well-traveled routes, such as between New York and London. The hope is that they can pick off customers who aren't willing to pay the high prices charged by traditional players, such as Virgin Atlantic and British Airways. But trying to steal a competitor's best customers is always a dicey proposition: The only thing you can predict with certainty is that the competitors will respond—fiercely.

Furthermore, high-end customers are the most demanding and the least likely to tolerate annoying limitations, such as arriving at the out-of-the-way airports used by many of these entrants. While discount seeking travelers are happy to put up with those inconveniences, those seeking affordable luxury are much less likely to embrace traveling out of their way. Expect the upstarts to struggle in 2007.

Tata's 1-lakh car

The automobile industry has seen successive waves of low-end attackers. In the 1950s and 1960s, small cars from Japanese auto manufacturers arrived in Western markets. While initially the cars were of inferior quality, Toyota re-

lentlessly moved up market and is now poised to pass General Motors as the world's largest auto manufacturer. Toyota's disruptive production model has allowed the company to produce high quality cars at low prices, making it vastly more profitable than the market leaders it has disrupted.

The next wave of attackers came from Korea in the 1980s. Like the Japanese, the first cars produced by Kia and Hyundai weren't very good, but they were extremely cheap. Unlike Toyota, however, Korean manufacturers did not utilize a fundamentally different production model.

This means that the profitability of the Korean model rests on lower labor costs and the lack of expensive retiree benefits burdening many Western auto makers. As long as those advantages persist, the Koreans will be able to make more money at price points similar to their Western competitors; if those cost advantages disappear, so will the Korean's superior margins.

The next wave of attackers is emerging in India and China. Of particular interest is the development of the so-called 1-lakh car by Tata Motors, part of the sprawling Tata Group conglomerate. Tata Motors' vision is to produce the "people's car" by getting the price of the car down to 100,000 rupees (1 lakh) which is the equivalent of about \$2,500. The 1-lakh car will not be a stripped-down passenger car or glorified auto-rickshaw but a "proper" car that meets all safety and emissions norms.

Tata Motors' is targeting not only scooter and motorcycle buyers who pay around \$1,250 today, but is also

comes after Netflix has claimed millions more subscribers than the former market leader and already jumped to the next thing: providing streaming, on-demand video. If Netflix can marry its ability to understand consumer's tastes with its ability to profitably master complicated logistical matters, its video on-demand service could position the company to create a new wave of disruptive growth.

A devastating war for the second screen?

While the business model for how to make money on the wireless Internet isn't yet clear, a growing number of competitors are targeting the traditional television market. Expect telecommunications players like AT&T to struggle to create viable growth businesses, because they are offering a "me-too" service compared to offerings from cable companies and satellite providers. While they might take market share, price wars are likely to break out, with the "winner" the owner of a sharply less profitable market.

Disruptive printing?

Kodak recently announced that it would introduce an inkjet printer that it hopes will appeal to consumers who are tired of paying high prices for replacement inkjet printing cartridges. The printers will cost between \$150 and \$300 and will slash ink cost per page by 50 percent compared to printers sold by Hewlett-Packard and Lexmark International. Since incumbents make most of their profits on the cartridges, their motivation to respond to Kodak's attack is likely to be low. By making it simpler and cheaper to print pictures at home, Kodak might simultaneously grow the market while stealing share from big rivals.

going after nonconsumers—people who can't purchase any form of motor transportation at all. To achieve this stunningly low price point, Tata Motors completely rethought the automobile design and production process.

For instance, the company is contemplating an innovative distribution model where it ships semi-finished kits to rural entrepreneurs who then run small assembly and service shops. The approach could bring distribution to rural areas of nonconsumption and facilitate greater customization.

You can predict that the first versions of the 1-lakh car or similar models produced by Chinese manufacturers won't be very good. If history is any guide though, quality will improve and companies that first engendered chuckles will emerge as serious competitors to current incumbent manufacturers. Tata's relentless focus on price and innovative distribution models positions it well to lead this next wave of attackers.

Decentralizing health care

As the population ages, adults are increasingly finding themselves concerned about the care of their elderly parents. Historically, well-meaning adults could have their aging parent move in with them or they could move closer to an ailing parent. Advancements in telecommunications and diagnostic technologies have the potential to create a different model, allowing adults to monitor their elderly parents remotely over the Internet.

For example, New York-based Living Independently Group and Texas-based Lusora plan to intro-

duce systems that can alert emergency response workers automatically if a series of wireless sensors detect irregular activity patterns. (For an in-depth look at wireless network sensors, see "A Structured Approach to Technology Assessment," *Strategy & Innovation*, September-October 2005.) The systems allow children or caregivers to monitor activity over the Internet or to receive automatic updates via phone, email, or text messages.

Like many would-be disruptors, both companies should start as simply as they can. Trying to build a fail-safe system is complicated and expensive—and could lead to serious liability problems. A simple, easy service that provides peace of mind to Baby Boomers while allowing their aging parents to maintain valued independence could be a great starting point for a truly disruptive solution.

These kinds of solutions are part of a general movement toward more decentralized health-care delivery. Remote monitoring could help companies like Nashville, Tenn.-based Healthways, Inc. provide value-added services to individuals who have chronic conditions like diabetes. Instead of coming in for regular appointments or trusting the patient to identify anomalies, remote systems can make sure individuals receive the right treatment at the right time.

Companies are also experimenting with approaches that allow them to provide diagnosis and treatment without being physically present. Companies like Visicu and Nighthawk Radiology have already begun to introduce offerings that allow trained professionals in re-

remote locations to provide services, typically at lower costs.

The key to success for remote models will be for companies to focus their efforts on the right kinds of treatments. If companies try to handle the most complicated cases remotely, expect them to struggle because of unpredictable interdependencies and the need to actually see the patient. If they focus on more rules-based treatments, then they could be well positioned to succeed.

Radiology is an excellent fit for this kind of model. Once an image is captured and digitized, a trained professional anywhere in the world can provide a competent reading. While solving the hardest problem is a noble endeavor, research shows that simple starting points are more likely to result in viable solutions in the long term.

Disruptions will continue to reshape entire industries

Throughout history, disruptive forces have reshaped numerous industries. Each of the disruptive trends discussed in this article could drive further change in their respective industries, producing new winners and losers. As is always the case, incumbent companies that spot the trends and respond effectively can utilize disruptive forces to their advantage. Those that don't run the risk of missing great growth opportunities and ultimately losing their position of industry leadership. ♦

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ing the needed results in your core businesses in charge of an important new initiative actually might hinder an innovation's chance for real growth.

My recent research suggests that the mistaken application of some of the most commonly used tools of financial analysis can be equally responsible for hindering successful innovation efforts. Beginning in this issue of *S&I* and continuing for the following issue, I will take an in-depth look at three of these failed paradigms.

In this article, I examine how firms can go wrong when they rely on the doctrine that fixed or sunk costs should not be considered when evaluating future investments. This notion confers an unfair advantage on attacking firms and shackles incumbent firms that are attempting to respond to an entrant's onslaught.

In the March-April issue of *Strategy & Innovation*, I will explain both how problems can result from a reliance on traditional discounted cash flow models and how the paradigm suggesting that management's ultimate goal should be the maximization of shareholder value can lead to inefficient innovation efforts.

Over the course of this series, I will describe how each of these three methods and beliefs are systematically biased against successful innovation. I recognize, of course, that in a brief series such as this I can only raise some very complicated issues in a simplified way. The aim here is simply to raise these concerns in the hope of beginning a dialogue that can eventually examine and resolve them.

Not accounting for fixed and sunk costs

The paradigm of financial decision-making that states that sunk (or fixed) costs should not be considered when evaluating a future course of action is widely accepted and wildly detrimental to corporate interests.

As the argument goes, managers need only to determine the future or marginal cash outlays (either capital or expense) that are required for an innovative investment; subtract those outlays from the marginal revenues that will likely materialize; and discount the resulting cash flow to the present.

Despite the apparent logic that underlies this principle—that one can't undo old decisions and, thus, should make the best decision given the current status quo—it can make the same investment appear attractive to an attacking company, but unattractive to the incumbent leader that is being attacked. In other words, it exacerbates the innovator's dilemma.

Two examples from the history of the steel industry and a brief look at the retail industry illustrate how this principle makes it very difficult for companies that can and should invest in new technology—whether sustaining or disruptive—actually to do so.

The faulty explanations for the rise of Japanese steel makers

The first instance occurred when Japanese steel makers began flooding America's market with low-cost steel, starting in about 1965. At the beginning, the Japanese attackers' advantage was attributed to the low cost of labor in Japan, which was

rebuilding its economy from the ruins of World War II.

By the mid-1970s, however, after Japanese labor costs had escalated significantly but the cost advantage of Japanese-made steel persisted, it became clear that there was a major technological driver that gave the Japanese steel makers much lower costs than those of the American companies: The Japanese had been much more aggressive in adopting two important new processing technologies—continuous casting and basic oxygen furnaces, which together reduced the cost of making steel by about 20 percent.

The fact that nearly all Japanese steel mills had adopted these technologies by the early 1980s, whereas only about half of America's steelmaking capacity had adopted these technologies (which were sustaining innovations relative to the business models of companies on both sides of the Pacific), was a commonly accepted explanation for the Japanese advantage.

Articles in the business press typically vilified the executives of the US steel companies for their short-sightedness in not investing in these capabilities that were so critical to competitive success.

Closer examination, however, reveals that it was the logic of ignoring sunk and fixed costs that profoundly shaped this outcome. Plastics and steel minimills were also disrupting America's integrated steel makers throughout the 1970s and 80s. As a result, the available market for the integrated American steel makers had been flat or shrinking—meaning that there was no need to build new integrated steel-making capacity

because there already was excess.

In fact, the most modern integrated steel mill in America had been built by Bethlehem Steel in 1957 in Burns Harbor, Indiana. Because continuous casting and basic oxygen furnaces were not available at the time, it was a no-brainer to incorporate into the American mills the technology that was state-of-the-art at the time they were constructed: ingot casting and open-hearth furnaces.

The Japanese steel companies, in contrast, began to boom in the mid-1960s as their best customers—automobile and ship-building companies—began to export aggressively to the rest of the world. Between 1963 and 1979, twenty-three new greenfield steel mills were built in Japan. It was a no-brainer to incorporate into the Japanese mills the technology that was state-of-the-art at the time *they* were constructed: continuous casting and basic oxygen.

Choosing the right comparison

As a result of these differences, assessing the foresightedness or aggressiveness of Japanese and American managers by contrasting the extent to which they adopted these innovations is a flawed comparison. Each employed the latest technologies available at the time their plants were built.

To contrast whether one nation's steel executives were more or less aggressive than those of the other in adopting the new technologies, therefore, one needs to compare the stock of steel mills that existed in America and Japan in 1960, and compare the rate at which they retrofitted their old mills

with the new technology. On that basis, the Americans were twice as aggressive in retrofitting the existing mills. The Japanese competitive advantage in steel, in other words, is attributable to the fact that they were growing, and therefore out of capacity.

When considering an investment, managers are taught to calculate the internal rate of return (IRR) on that investment, and compare it with their weighted average cost of capital (WACC).

However, the calculation is different for executives who find themselves with extra capacity, such as those running the US steel companies. They have been taught to ignore the sunk or fixed cost of the existing system.

They, therefore, compare the marginal cost of producing an incremental unit in their existing plant, versus the full cost (and long-run average cost) of building and operating a new plant. Because the marginal cost is the lower of the two, and facing a comparable revenue stream in either case, the calculation gives an incentive for the incumbent to utilize its existing assets more fully—and delay investing in the technology that would put it in a fundamentally different, lower-cost position.

In contrast, the attacker has no such comparison to make. It simply builds the plant utilizing the latest technology if the expected return exceeds its cost of capital.

The rise of steel mini-mills and the difficulty of response

In 1988, United States Steel Corporation (USX) was under increased pressure from steel min-

imills such as Nucor and Chaparral, which began disrupting integrated companies in the mid-1960s. They began by picking off customers in the least-demanding product tiers of the market, such as concrete reinforcing bar. They then moved relentlessly up-market, using their inherent 20 percent cost advantage to capture markets such as angle iron, bar & rod, and structural beams. By 1988, the minimills had driven the higher-cost integrated mills completely out of lower-tier products, and Nucor had begun building its first minimill to roll sheet steel.

It had always been easy to discount the disruptive potential of the minimills because the quality of the steel they could make was marginal—only customers in the least-demanding tiers of each product market would buy what the minimills made.

By the time Nucor approached the sheet steel market, however, a significant group within USX had concluded that this constituted a grave threat. They reasoned that even though Nucor's technology, called continuous strip production (CSP), was capable only of rolling relatively low-quality sheet at the outset, Nucor's track record was one of vigilant improvement.

Nucor decided to build a new CSP minimill in Crawfordsville, Indiana. For an investment of \$260 million, it calculated that it could sell 800,000 tons of steel annually at a price of \$450 per ton. The cash cost to produce a ton of sheet steel in the Crawfordsville mill was \$270. Accounting for the timing of cash flows, the internal rate of return on this investment to Nucor

was over 20 percent—substantially above Nucor’s weighted average cost of capital.

A group of USX engineers was assigned to evaluate whether and how USX might invest in this new CSP technology. USX had access to more capital with which to build a CSP minimill than Nucor did. But the USX engineers did not even consider building a greenfield minimill like Nucor had decided to build.

The question they asked instead was which type of continuous casting technology—conventional or CSP casting—they should install in their existing mill in the Monongahela River Valley near Pittsburgh.

How excess capacity and return on assets alters the financial equation

Why didn’t the USX team consider building a greenfield minimill to compete with Nucor? Because the Mon Valley mill had 30 percent excess capacity. The marginal cash cost of producing an extra ton of steel in Mon Valley was about \$15 per ton.

Because the cost of building the Mon Valley mills was sunk, USX’s financial analysts contrasted the marginal revenue minus the marginal cost of producing an extra ton in the existing mill (\$450-\$15, for a marginal cash flow of \$435 per ton), versus the marginal cash flow per ton in a greenfield mill of \$180 (\$450-\$270).

What made the situation even more vexing was consideration of the ROA impact. The Mon Valley plant essentially was fully depreciated, so that the marginal cash flow of \$435 on a low asset base looked very attractive.

And therein lies the rub. Nucor, the attacker, had no sunk or fixed cost investments on which to do a marginal cost calculation. Crawfordsville was the only item on the menu—and because the IRR was attractive, the decision was simple. US Steel, in contrast, compared the full or *average* cost of the greenfield plant against the *marginal* costs in the old. A core driver of an investment’s attractiveness to company executives is the attractiveness of the alternatives on their menu.

So what happened? In modeling as well as in reality, the P&L and balance sheet of US Steel’s integrated steel business would look better if existing capacity were more fully utilized. One therefore could not expect the company’s managers to attempt anything else.

The decision to build a new mill that would create a different average cost capability in the corporation could only have been made by executives one level higher than those responsible for the performance of the integrated steel business.

In the end, the US Steel salespeople and executives did not fill the excess capacity of the Mon Valley plant with additional volume. The reason is that gross margin dollars per order were more attractive for higher, more specialized grades of steel than those that initially could be made in the disruptive compact strip minimill.

And even if they had found a way to motivate their sales and manufacturing teams to slash prices in order to fill its excess capacity, the long-term reward to US Steel would have been that it had the capability of rolling sheet steel at 20 percent higher average costs

than could Nucor with its CSP mill. Maximizing marginal profit, in other words, caused them not to minimize long-term average costs.

In many circumstances, it seems that short-term marginal optimization can hinder long-term capability creation.

Competition in ‘big box’ retail

Though I am not privy to their internal financial calculations, I suspect that this same incumbent’s dilemma lies at the root of the inability of retailing pioneers to blunt the attack of later entrants. For example, Circuit City was the very successful pioneer of big-box consumer electronics retailing. As it grew, it put lots of sunk costs into the ground—in the form of locations, leases, fixtures and formats.

Best Buy then came along with much larger, lower-cost stores, laid out in a different format than Circuit City’s stores had been. After Circuit City’s executives saw the first Best Buy store, why didn’t they just copy it?

I suspect they were paralyzed by the same paradigm that kept US Steel from building a greenfield CSP minimill. The financial calculation for Best Buy, which was growing and adding stores, was uni-dimensional. If the projected cash flows from a new location yielded an IRR that exceeded its weighted average cost of capital, building another store in its large, efficient format made sense.

But for Circuit City, the calculation contrasted the marginal costs and marginal revenue that they could generate by operating an existing store—with its existing fully-depreciated fixtures—versus the

full costs of building and starting up a new store. The same investment that made sense to the attacking company made no sense to the entrant.

It is quite possible that this asymmetry of calculation is a root reason why K-Mart did not respond to Wal-Mart's superior strategy and why Lowe's has gained so much market share against Home Depot.

When to account for sunk costs

I suspect that there are circumstances where ignoring sunk and fixed costs in these calculations does *not* lead to long-term trouble—such as when there are no disruptive competitors on the horizon or if there are no direct competitors building new capacity that employs significantly improved technology.

In environments characterized by disruptive business model innovation or significant process technology change, however, it seems that adhering to this sunk-cost dogma is wrong.

Application of this doctrine in the wrong circumstances seems to clarify several anomalies I have observed in my studies of innovation. I frequently hear executives bemoan how expensive it is to build new brands. As a consequence, they seek to leverage their existing brands, even as entrants create the new ones.

In the same way, established firms' executives eschew creating new sales channels to new customers because channels, too, are expensive to build and secure—and while they attempt to leverage their established structures, entrants nimbly forge new channels to the customer. Time and again, I have

seen incumbent companies set up a separate, focused business unit to pursue a disruptive opportunity, only to have that decision reversed by a subsequent executive, who seeks to leverage fixed overheads by combining the sustaining and disruptive business units.

While incumbents seek to leverage and enhance the profitability of what they have, entrant companies seem able to come in right under the noses of the leaders, building successful new channels, brands, and business units. It certainly isn't because the entrants have more resources, and can therefore outspend the incumbents in pursuit of these opportunities. Possibly a better explanation is that the attackers have one investment on the menu from which to choose, while the incumbents have to choose between full-cost and marginal-cost options.

The proclivity of most managers to leverage fixed costs and ignore sunk ones biases them against making the same investments that entrants and attackers find to be profitable. When a successful attacker is gaining ground, therefore, executives of the companies being attacked need to do their investment analyses in the same way that the attackers do.

This is the only way they can see the world as the attackers see it, and the only way they can predict the consequences of not investing to pre-empt the attackers' growth plans. ♦

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