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BUSINESS APPLICATIONS



The Dallas Cowboys have just intercepted a pass in New York Giant territory. Coverage of the game is about to yield to a commercial break. Time to pull away from the television, and go forage in the refrigerator. But wait. What's this? In a bizarre twist on reality it's a television advertisement about people watching television. A group of attractive young men and women are arguing about which program to watch. Some argue for a beauty pageant, and others want to watch hockey.

One of the viewers settles the argument: "Let's watch both." He laps the television with a bottle of Miller Lite. The screen flickers momentarily, and then we suddenly see women dressed in formal gowns playing ice hockey. They skate around carrying hockey sticks, and check each other hard into the boards. One of them smiles to reveal a gap where her front teeth ought to be.

You have just been captured by one in a series of clever commercials developed by Leo Burnett Company for Lite beer.

Others in the set include “full-contact golf” in which a frail-looking golfer is laddled by brawny, fully uniformed football players, and “luge bowling” in which a luger is pursued down the course by an enormous bowling ball.

These commercials show us yet another use of conceptual combination. It can foster creatively captivating ways to market products.

Advertisers must persuade you to buy things, and they must leap two critical barriers to do so. First, they must capture your attention. If you peek to the refrigerator rather than vegetating in front of the TV during a commercial, all the clever scriptwriters and attractive models will be unable to reach you. Having roped you into watching, they must also penetrate your defenses deeply enough that you will remember their product and pick it up when you shop. So, the ad must be engaging and memorable.

The humor that ensues from combining the wildly discrepant concepts of beauty contests and ice hockey arouses interest and keeps viewers watching. Humor is not a key feature of hockey or pageants alone. It emerges when they are joined together.

The ads are also memorable because the idea of combining discrepant concepts reinforces an earlier Lile beer theme. Previous commercials had emphasized that the beer tastes great, but is less filling. The more recent series secures the link more tightly by noting that “If you can combine great taste, and less filling, you can combine anything.”

CONCEPTUAL COMBINATION IN PRODUCT EXTENSION AND POSITIONING

There are many other solid business uses of conceptual combination, not the least of which are product extension and positioning. Most products follow a characteristic life cycle. When

first introduced, their relative anonymity limits sales and constrains profits. As they become better known, sales and profits increase dramatically. Then the rate of increase slows, and finally, sales and profits decline. To remain competitive, businesses constantly introduce new products, either by adapting old ones or by developing new ones. Conceptual combination can aid these efforts by suggesting new products and new ways to position a product in the marketplace.

Sometimes forming new combinations is as simple as taking two or more existing products and melding them together. The Swiss Army Knife discussed in the previous chapter is a good example of such a product. A more personally tempting one is the inspired and delightful marriage of chocolate and peanut butter to form peanut butter cups. A recent high-tech version is the marriage of a color television screen to a camcorder in a product that treats proud parents and awed tourists to immediate feedback on how well they’ve captured the moment.

It’s relatively easy to think of additional blends. What if we brought together a recliner—possibly built for two—with a VCR, a CD, a large surrounding screen, and a killer sound system to construct the ultimate in self-indulgent home entertainment devices? What about coupling a sound chip and a zipper so that a discrete alarm would sound if you’ve forgotten to secure your pants? What about merging an exercise bicycle and a manually operated generator so that power would go to a radio or TV only as long as a person continued to work out?

Random pairings might evoke marvelous new creative ideas, but they may also lead nowhere. The competitive nature of the business world means that companies can only afford to attempt just so many innovations. So a more targeted approach to finding promising combinations is called for. A good place to start is with observations of how people think and behave. What separate items do they combine for themselves?

Health-conscious partners often mix wine with soda to concoct a refreshing drink that’s low in calories and only mildly alcoholic. So it was only natural for beverage makers to blend

wine and carbonated soft drinks to formulate ready-to-drink wine coolers. Snackers love to dip chips, but may not like the potential embarrassment of dropping globs of dip on their party clothes. One solution put forth by several food companies: spread a sour cream and onion-flavored coating directly onto chips. Children devour millions of peanut butter and jelly sandwiches every year. This led naturally to swirling peanut butter and jelly together in the same jar.

Sometimes product extension is just a matter of probing what else an existing product can do. Church & Dwight Company, maker of Arm & Hammer baking soda, for instance, has often touted the fact that baking soda absorbs odors. They have encouraged people to put a box in the refrigerator, freezer, or any other location where odors might crop up. Now they have taken this basic concept and extended it to specific new products, including their own brand of deodorant, cat litter deodorizer, laundry detergent, and toothpaste.

Sometimes the merger is between abstract concepts rather than physical objects. These blends can lead not only to new products but also to new ideas for positioning or promoting a product.

A classic example of combining opposing concepts to position a product in the marketplace is the Nissan Altima. It is pitched as providing affordable luxury. It appeals to the market segment that may desire an expensive luxury car but not have the resources to purchase one. The Buick Park Avenue evokes a similar theme by claiming to be "The best luxury car buy in America." Hyundai recently joined the same chorus by pitching the Accent as embodying state-of-the-art technology in an affordable car. Other automobile manufacturers have emphasized affordability safety: You don't have to be rich to feel safe. You don't have to pay an exorbitant price to obtain the security of antilock brakes and dual airbags.

In fact, almost any valued trait that normally comes at a high price could be combined with the concept of affordability to pitch a good or service. Consider, for instance, the long-distance

phone wars with their competing messages about quality phone service at a lower price.

By combining opposing traits, manufacturers can carve out special niches in the world of products. If we think of products as existing in some vast space, we can see that some parts of that space are empty, just waiting to be filled by a successful offering. Combinations bring out unique ways of filling those gaps. Of course, the space must be a desirable one. Some gaps are there for a good reason. Combining an exorbitant price with a low-quality product may plug a whole in the space of possible products, but people are unlikely to rush out and buy an "expensive economy car" or a "bland but fattening snack."

Affordability is obviously critical to many products, but it need not be included in every combination. How many foods beckon dieters with the combination of scandalously delicious fare but a minimum of fat and calories? What new products or sales pitches would emanate from rugged comfort or rugged elegance—perhaps the sort of pickup truck you could bounce around the ranch in and then later use to escort your date to the ballet? What about toys for people who take their fun seriously; financial services that promise growth and security; personal products for the tender yet virile man or the competently assertive yet softly sensuous woman; or living spaces or transportation services for those who seek rural solitude combined with urban convenience? It's easy to see how a melding of concepts that seem to be incompatible can open a world of possibilities.

Putting abstraction to work also can boost your efforts to position products. You can use it to rationally assess which consumers you want to pitch to, and which competitors you want to target. We saw earlier that moving to the highest level of abstraction can help people avoid getting hung up on specific details from the past, and we noted how important that might be in spurring an initial idea for an invention. For positioning an existing product, however, the act of formulating an abstract hierarchy is more important than moving to its highest level. It may actually be better to position a product at a very

specific level, where there would be a smaller market but fewer competitors.

Imagine that you wanted to bring a new dessert to the market. You might begin by abstracting the mental structure of that type of product. At the highest level in the structure would be the very general category of desserts. You could then divide that broad grouping into fattening and nonfattening types, and further subdivide fattening desserts into ice cream, pie, cake, and so on.² How you pitch your new offering will depend on whether you want to compete with all dessert makers for the vast market of all dessert eaters, ice cream makers for the smaller market of ice cream lovers, or somewhere in between.

No matter where you decide to enter the game, it is the act of constructing the abstract hierarchy that permits you to develop the best new strategy. You could even combine abstraction and conceptual combination by using abstraction to get you to the right level, and combination to help you decide what to merge. You may want to compete for the high-end, rich and fattening ice cream market by developing a new flavor that combines the most exquisite chocolates with the thickest of cream bases.

Using mental imagery to mentally merge separate components can also aid in crafting symbols to represent companies. In Chapter 3, we described an imagery technique for generating creative symbols and designs, using preinventive forms. This same technique could also be used to develop creative company logos. Some examples of how various companies might generate preinventive forms to represent their names or products are illustrated in Figure 6.1. Note that each of these logos was created by mentally blending the same three parts—a circle, a square, and the letter “D.”

In general, you would want the logos to be as interesting, memorable, and meaningful as possible. This will depend on the extent to which the logo matches the type of product or the reputation of the company. Some recent experiments have demonstrated, in fact, that the way people interpret a particular logo

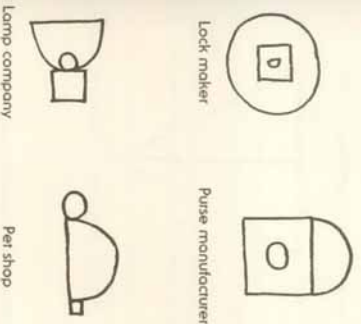


FIGURE 6.1. Potential company logos from preinventive forms.

depends on their knowledge about the company that the symbol represents.³ For instance, consider the preinventive form shown in Figure 6.2. How appropriate would it be as a logo for a (1) car company, (2) chemical company, (3) clothing manufacturer, or (4) bicycle company? Clearly, the value of a particular logo would depend on the context in which it was used. Once designers decide to use preinventive forms to stimulate ideas, they can adapt the forms to meet their particular needs.

MENTAL MODELS OF THE PURCHASER AND THE USER

A young baby wails. A toddler screams in tearful protest. An otherwise brave adult winces, more in anticipation than from

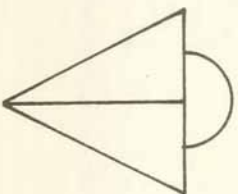


FIGURE 6.2. Preinvenive form as source of ideas for compomy
injections.

actual pain. What's wrong with these people? They're all being injected by a medical professional they had trusted just moments before.

Nobody likes being jabbed with a needle, in the arm or elsewhere. Even when we know injections will help us in the long run, we do not gleefully seek them out. The idea of having our skin punctured by a sharp object brings no thrill of anticipation. Some of us even fear becoming infected with the HIV virus or some other terrible agent, despite believing firmly that this particular needle has never been used before. For physicians and nurses, who surprisingly often stick themselves with used needles, the fear of infection is somewhat more justified.

But how else can we inoculate ourselves against the yearly onslaught of the flu, fend off dreaded childhood diseases, such as measles, mumps, and rubella, or quickly disperse large doses of antibiotics throughout the body? It seems obvious that to propel certain substances into the bloodstream, we have to drive a suitable tunnel through the skin, and the business end of a syringe serves that purpose. We have done things this way for centuries. The concept was introduced in the 16th century, and working models were available as early as the 17th century.

It's such a deeply ingrained concept, that it's hard to imagine anyone would question it. But now consider Bijector, a product developed by Bijector, Inc. that shoots doses of medicine through the skin with compressed carbon dioxide. No needles. No fear of accidental contamination. This type of device represents a sterling creative leap, a rejection of a well-established bit of prior knowledge.

But the Bijector story doesn't end there, and its continuation is telling: ¹ underscores the difference between innovation and success.

You would think such a marvel would be gladly welcomed by injectors and injectees alike. Despite providing improved safety and efficiency, however, the initial product did not sell well. Obviously, if a company cannot convince people to buy its product, all the innovation in the world will not help it remain competitive.

In retrospect the first Bijector model had problems. Its shape and the location of its trigger and safety device made it unwieldy; it couldn't deliver variable doses, and it made a startling hiss.² The conical thread running through these problems is that, from the perspective of the people who give and receive injections, the gadget was not as "user-friendly" as it ought to have been.

Cole Bijector have anticipated these problems? Perhaps they could have contemplated the mental models of the potential users more fully. Envisioning how patients would respond to the appearance of the product when they first see it. Work through how they would await a second injection after being startled by the hiss of their first one. Weigh, as a medical professor might, the relative advantages and disadvantages, the ease of use, the safety factors, and so on, of standard hypodermics and the Bijector.

Bijector now has a new model available. It's easier to use and more visually appealing, it can give variable doses, and it doesn't hiss. Whether the new version sells itself remains to be seen. One measure of its potential, however, is that *Business Week* named it a gold medal winner among medical and scientific products in its annual design awards for 1993.³

In the chapter on product development, we noted that inventors would do well to envision how people might actually use a new device. By taking a mental walk in a prospective user's shoes, an innovator can continue a more appealing product. Advertisers, who must continually develop new ways to market products, can also benefit from seeing the world through the eyes of their audience.

Sometimes contemplating the perspective of potential buyers is as simple as thinking in their native language. You can imagine, for instance, the hilarity that would greet a foreign car manufacturer that tried to market a vehicle called the "Doesn't go" in the United States. We might judge it to be an unusual approach, but probably not a very creative one, because it would be unlikely to accomplish the clear goal of selling the product. But now consider the problem of Chevrolet attempting to advertise the "Nova" in Mexico. "No va" in Spanish translates as "doesn't go," and Spanish-speaking viewers could be excused if they rolled on the floor in spasms of laughter when they viewed the ads.

Maintaining an awareness of the audience is sometimes a more subtle process. There are cultural differences in the meanings of body motions, in the nature of greetings, and even in preferences for certain numbers, colors, shapes, sizes, and symbols. A hawker of products who ignores these differences, who does not walk the proverbial mile in his or her audience's sandals, risks at best not attracting new buyers, and at worst offending an entire nation. Once again, knowledge is critical to the development of new ideas. In this case knowledge of how potential buyers view the world. Donald Norman's claim that developers of products should contemplate the mental models of potential users extends to marketing those products as well.

Sometimes the buyer and the user are different people, and this raises yet another challenge to those who would develop effective new marketing strategies. For instance, very few toddlers drive the family car to the local supermarket to buy their own food and diapers. Yet they represent a huge market for those products. Whose perspective should you take?

In the past, advertisers climbed into the minds of children to concoct ads aimed directly at their concerns. Consequently, they crafted ads that promoted foods as being sweet or otherwise fun to eat. The hope was that the tiny minions who saw these ads would carry the message forward to their parents, especially while seated in a shopping cart at eye level to cereal boxes. And it was a powerful strategy.

More recently, advertisers have embraced a compromise strategy. They now promote cereals, breads, snacks, and other foods as being tasty, thus satisfying to children, but healthy, thus consonant with the world view of the parents who actually spend the dollars. By considering the way both the buyer and the user think about things, a highly successful marketing approach has emerged. General Mills's advertisements for Kix are a particularly powerful example of this strategy with their simple yet effective slogan: "Kid-Tested, Mother-Approved."

Sometimes, even the best efforts to accommodate the parent and child can go awry, however. Consider the omnipresent disposable diaper. Manufacturers have spent millions of dollars over the last several years to perfect this technological marvel. Their keen interest in baby bottoms is not surprising. In the United States alone, more than 4 million babies are born every year, and each requires anywhere from four to ten daily-diaper changes. A company could absorb the costs of research and improve its bottom line by wrapping up just a small portion of the market.

From their crude beginnings, disposable diapers have seen a multitude of changes. Parents who cloaked their babies in disposables only 10 years ago are stunned when they hear about recent improvements contained in today's versions. These compact little miracles boast linings that draw liquid away from the child's bottom (and keep it away), filler material that can absorb several times its weight in water, leakage guards along the edges, resealable tapes, areas of absorbency strategically lagged for boys versus girls, and tailor-made shapes to ideally suit the changing body proportions of infants at different ages.

So fabulously absorbent are these modern throwaway diapers that any parent who has put a child wearing one into a pool has noticed that the child seems to weigh twice as much coming out.

Clearly, some of these improvements have the baby in mind. Others are directed at the parents. Mom and Dad, for instance, love diapers that can hold a whole night's output without either leaking or irritating the baby to the point of waking. Presumably, babies also appreciate the greater comfort of drier bottoms and fewer rashes.

But now let's consider the next step. Any parent will tell you that toilet training is no fun. Any toddler trying to gain control of the process will concur: Children want to grow up, but some fear sitting on the potty. Others have not yet learned to read the signals their bodies send them. In either case, once a child begins to venture out from the comforting confines of diapers, messy accidents happen. Parents become frustrated. Children can feel humiliated. What's a parent to do?

A clear need existed, and disposable diaper makers were quick to satisfy it. After perfecting ways to keep younger babies drier and more comfortable, diaper manufacturers went on to put all they had learned into disposables that children in the midst of toilet training could remove for themselves. They could use the potty when nature called, and then put the disposable back on. If an accident happened, it would be contained.

This was great in theory. It appealed to the child's sense of independence, and certainly enraged parents who would be faced with fewer messes to clean up. The only problem was that the technology was too good. The little would-be potty users often do not know they have wet themselves. They can have an accident and not even feel uncomfortable. Consequently, toilet training can be unnecessarily delayed.

So now for the ultimate irony. Manufacturers of these child-removable trainers have decided to introduce a new technological breakthrough: trainers that have a special lining to let the child feel wet! Before all of the improvements in modern diapers, this was easy to accomplish. Now it's an important innovation.

Could diaper makers have foreseen the potential problems with highly absorbent trainers? Possibly not. They may have needed to get further inside the child's head than any adult is capable of doing. It might have helped them to construct a mental model of a child using such a diaper, from the child's perspective, but only if the designers envisioned the child's reaction to having an "accident." This could have made them realize that the child might not even notice the accident. On the other hand, it may be asking too much of the designer, who, after all, is an adult many years beyond toilet training.

INNOVATIVE PRODUCTS AND INNOVATIVE PROCESSES

A new product fails. A business loses money. Heads roll. A sad tale indeed.

A different product exceeds expectations. A company reaps huge profits. Promotions follow. A happy ending.

The challenge for innovative thinkers is to compose stories of the second type and avoid those of the first type. Capitalizing on the techniques of creative cognition can help.

It's no secret that business today is ruthlessly competitive. Corporate executives find themselves navigating a harsh landscape in which a single misstep, a slight misreading of their guiding compass, can spell disaster. At the same time, a successful journey, a mapping out of a new market, can secure extravagant monetary rewards, and bring immense personal satisfaction.

In the previous chapter we concentrated on how people forge new ideas for inventions. But successful innovation in business—capturing market share or opening new territory—requires more than just a good, novel idea. It demands creativity in how people design, engineer, build, test-market, promote, and distribute a product. Moreover, it mandates that all of these disparate partners dance together to the same music in a smooth rhythm.

Changes in the marketplace have forced corporations to seek new ways for their divisions to work together. The life cycle of products, particularly in high-tech fields, is becoming ever shorter. This makes it more and more critical to bring products to the market quickly. It does no good to design and engineer a marvelously creative invention if a competitor beats you to the market. U.S. corporations learned this lesson all too well in the 1970s and 1980s, inventing one electronic wonder after another, but being left at the starting gate each time by more efficient Japanese that had rapid products out to consumers.

In other words, beyond cultivating original ideas for goods and services, corporations must find creative new ways to quickly manufacture products, and more generally, to run their entire organizations. They must reject their old knowledge of the very things "ought" to be done, the ways they have always been done in the past.

But as we've seen, breaking with the past is difficult. We typically build our visions of the future on the foundations of what has come before. In formulating new ideas, more often than not we merely impose modest variations on what we already know. Conjuring up images of anything wildly outside our experience is more demanding. This is no less true of executives and managers plotting a course to larger profits than of research subjects trying to visualize compelling extraterrestrials. Business people most often try to tweak existing corporate structures, rather than reject them entirely, in the same way that alien-builders simply adapt Earth animals, rather than summing up something completely different.

The problem is that existing corporate structures put up walls, literal and figurative, between the people who need to work together. If we base new solutions on these structures, we will become ensnared in the same trap.

These structures are rooted deeply in the tradition of "division of labor." If there are different tasks to execute, different people, working in separate departments, perform them. Some people design. Others assemble. Still others market the products,

order needed materials, keep track of inventory, hire new employees, pay bills, and so on. This strategy of dividing and conquering a large task made sense in an earlier era, but no longer applies in the current age of rapid change and increasingly sophisticated information technology.⁵

Communications software, shared data bases, advanced graphics displays, and expert systems can foster close ties among all people working on the same project—wherever they may be in the world. They can also aid a single case manager in overseeing an entire project from design to delivery, and they can equip a generalist to do the work usually reserved for several specialists in different departments. All of these benefits work in favor of bringing successful products to market quickly and with minimal cost. By promoting parallel or concurrent design, in which designers working on different components of a new product, manufacturing engineers, marketers, and those in charge of procurement all work together, businesses can bring an innovation to the marketplace with remarkable speed and efficiency.⁶

What technology can't do is make people think differently. That has to come from within. In their recent best-selling book, *Reengineering the Corporation*, Michael Hammer and James Champy argue for a revolution in the way corporations are structured, and implicitly, in the way people think about corporations. They define reengineering in two words: starting over. Hammer and Champy propose that we reject Adam Smith's old notion of division of labor, and replace it with an emphasis on processes that would cut across traditional divisions. In effect, they argue for corporate imagination to escape the bonds of influence from prior examples.

The principles of reengineering fit well with our idea that abstraction provokes creative innovation. Hammer and Champy advocate "fundamental rethinking and radical redesign of business processes."⁶ They exhort corporations to ask fundamental questions about themselves and how they operate. What do we do and why? How do we do it, and why do we do it that way?

You can answer these types of questions at many different levels. We make widgets. We supply a class of products. We take raw materials and convert them to useful goods for a profit. Abstraction helps to organize a hierarchy of answers, and makes transparent any implicit assumptions that may be holding back progress.

Fads come and go in the business world. Managers and executives constantly search for that new idea that will give them even the narrowest of competitive edges over their rivals. It is too early to tell whether "reengineering" is just another one of these fads, or a true revolution, but there is little doubt that it has taken the corporate world by storm. Because it urges people to think about the essence of what businesses ought to be doing, our bet is that it will continue to pay important returns well down the road.

SMALL STEPS AND GIANT PROFITS

When was the last time you went through a whole day without seeing a single aluminum beverage can? These compact containers are so ubiquitous, it's hard avoid them, and it's easy to take them for granted. Yet their popularity and seeming simplicity hide an intriguing world of design complexity.

Consider just the pressures a can must withstand. The tires on your car are designed to be inflated to a pressure of about 30 pounds per square inch, bicycle tires to about twice that much. But aluminum beverage cans, having skins only 0.003 inch at their thinnest point, and weighing in at less than half an ounce, must endure upwards of 90 pounds of pressure. Their ability to do so is a tribute to a long series of small but impressive technical innovations, including infusing the aluminum with other elements such as manganese and magnesium.²

An impressive innovation in aluminum cans is the integral rivet that holds the tab to the can. It isn't an extra bit of metal

jacked on. It's actually part of the material of the lid itself that has been stretched upward. This and other innovations reduce the total amount of aluminum that must go into a single can.

In fact, a prime goal of redesigning cans is to reduce the amount of aluminum required by even by a minuscule amount. Is it possible to do the same job, or better, with less material?

It's easy to see why this principle drives innovation. U.S. manufacturers punch out about 100 billion aluminum beverage cans each year. This mind-boggling figure translates to about one can per day for every man, woman, and child in the United States. Not surprisingly, then, tiny innovations in design and manufacture multiply into enormous increases in profits. For instance, because the aluminum in the can represents about half its cost, a new idea that would reduce the mass of the can by just one percent would save about \$20 million a year.³ It doesn't take a large step to bring about a giant leap in profitability.

But what this also means is that, unless someone dreams up a wildly different method for transporting soft drinks from producers to consumers, continued creative innovations are likely to take the form of small steps eked out by highly skilled experts. Despite their apparent simplicity, then, aluminum beverage cans are a prime example of how, in some industries, extensive expert knowledge is essential to making creative contributions. This highlights an importantly different face of creativity in the business world than we ordinarily think of. As with invention in general, creative innovation in business often happens in tiny increments rather than giant leaps.

WHEN TO CHANGE AND WHEN NOT TO

It was October of 1973, Spiro Agnew pleaded no contest to income tax evasion and resigned the Vice Presidency. Gerald Ford, Agnew's replacement, announced "I'm a Ford, not a Lincoln." And, the Organization of Petroleum Exporting Coun-

ties (OPEC) began to flex its muscles. In a bid to undermine U.S. support for Israel, OPEC imposed an oil embargo. The effect was immediate and devastating: A barrel of oil quadrupled in price in a matter of months. Gasoline prices went through the roof, and the makers of U.S. cars—Fords, Lincolns, and otherwise—would soon see their profits drop through the floor.

By early 1974 the Federal Energy Administration had printed gas rationing coupons, and fears of shortages compelled motorists to wait in lines for hours to fill their cars, even when they still had half a tankful remaining. But by far the most important impact was that consumers began to think about fuel efficiency, many for the first time in their driving lives. The coming demand for smaller, more economical cars should have been crystal clear to anyone who plugged into potential buyers' mental models of the driving experience.

The Big Three, Detroit-based auto makers either did not recognize the trend, or were unable to adapt to it in an innovative and timely fashion. They had difficulty breaking with their prior knowledge of consumer preferences and their past habits of making larger cars.

How did past history influence car makers' reactions to the oil crisis? Many readers are old enough to remember gasoline price wars. In the 1960s competing service stations ratcheted prices downward, sometimes dropping below 30 cents per gallon. They even tried to draw in customers by offering premiums, such as glassware, with each fill-up. Americans were in love with the open road. The low gas prices pushed their desires for ever larger and more powerful cars, and Detroit heeded the call with gas-guzzling behemoths.

With decades of tooling, and generations of engineering focused on power rather than performance, it's no wonder that the U.S. auto industry was shaken to its core by the upheavals of the 1970s. People were not accustomed to thinking smaller. The bulk of their existing models, technologies, and ideas worked against an easy transition to fuel-efficient vehicles.

The troubles of the auto industry sent shock waves well beyond Detroit. They had a profound effect on the economy in general and the American psyche as well, to say nothing of our relationship with Japan. Worse yet, early small-car offerings by U.S. firms bombed, and left a lasting impression that U.S.-made cars were somehow inferior to foreign ones. In other words, many consumers changed their mental models of American cars from being the "king of the road" to being the "bottom of the barrel." It has been a long hard climb back.

Schwinn is another example of a company that failed to adapt to changes in the marketplace. Never has a society been more obsessed with its physical well-being than Americans have been over the last 20 years. Explosions in the health club and athletic shoe industries are just two bits of evidence for this trend. So, with an appropriate look at the market, one might have predicted an upsurge in the desire for mountain bikes as a natural offshoot of this trend. But Schwinn could not or would not notice and respond to the change. It patterned its future after its past, and stuck to producing traditional bicycles. As a result, its market share dropped precipitously during the 1980s.⁹

Clearly companies have a better chance of avoiding this type of turmoil if they are willing and able to break with the past, and to rapidly adjust to change. Keeping a finger on the pulse of consumer desires can help. Putting another finger to the winds of change in consumers' mental models can provide information about the direction in which to make a break.

But change has to be carefully reasoned. In April 1985, the Coca-Cola Company revealed its plan to replace its nearly 100-year-old formula with a new one. In a chapter aptly entitled "The Marketing Blunder of the Century," Mark Pendegast has detailed the ensuing outcry.¹⁰ Loyal Coke drinkers were outraged and observers were befuddled. In the following months, the company fielded thousands of angry phone calls and letters, protesters poured New Coke out in city streets, and crowds at sports arenas vehemently booed ads for the altered beverage. By

July of 1985 public pressure had forced Coca-Cola to reissue the original version under the name Coca-Cola Classic.

How could they have made such a tactical error? Millions of dollars of research had shown that people preferred the taste of New Coke to the original formula and, more importantly, to Pepsi-Cola. As Pendergrast puts it, however, the "taste tests had missed one crucial point. Roy Shout's researchers had never informed their respondents that the hypothetical new formula would *replace* the old. Incredibly, no one had examined the psychological ramifications of withdrawing the old formula.¹¹¹ They had overlooked the fact that Coke drinkers loved Coke, and would respond to its withdrawal as to the loss of a close relation or good friend. No new acquaintance could take its place, no matter what taste tests said.

In creative cognition terms, when Coca-Cola changed the taste of Coke, they changed an essential property. New Coke simply was no longer Coke. And Coke was no longer it. The lesson is that, although innovation can open new markets, change that destroys the essence of a successful product can lead to disaster. Careful analysis of the way consumers conceptualize a product may shed light on what they consider to be unchangeable attributes, and may help companies avoid such debates.¹¹²

Detroit could not, Schwinn would not, and Coca-Cola should not have innovated. How can corporations know when, how, and what to change? There are no magic solutions, but once again we argue for abstraction. What are the fundamental goals of the organization? What are the fundamental desires of consumers? How can we bring our actions in line with those desires?

A GROUP AND ITS INDIVIDUALS

Cognitive psychologists care about the workings of individual minds, such as your own. They are less interested in how your

thoughts bend in the winds of influence from the people around you. We share this bias, and we have concentrated mostly on how you, as an individual, can use basic mental operations more effectively. Nevertheless, creative ideas do blossom forth from the combined efforts of many minds. They often sprout from the fertile soil of old knowledge, and they flourish when we and others carefully tend and nurture them. Inventors pattern their new ideas after existing schemes. Prolific writers are prodigious readers. Scientists craft their new theories within existing frameworks, or as very specific rebellions against previous ideas. Artists build on styles and schools that have preceded them.

In the business world, the view of creativity as a collaborative effort predominates. Corporations often reward "team players," and they stress the value of group problem-solving techniques, such as brainstorming. In fact, from some writings you almost get the impression that the words *brainstorming* and *creativity* can be used interchangeably.

What is brainstorming in business? It's a procedure in which a small group of people work together on a particular problem. They toss out potential solutions, and a "recorder" is charged with noting all of them down. The group may have a nominal leader, but that person's job is more to facilitate and keep ideas flowing than to direct group members along some set path.

The most important principle in brainstorming is that criticism is forbidden. Quashing someone else's idea is the worst sin a would-be brainstormer can commit. This principle works sort of like a mental "keep off the grass" sign. Novel ideas are often fragile seedlings that are easily crushed under the heavy feet of criticism. Knowing that all ideas will initially be treated with respect helps participants feel freer about going outside the bounds of conventional thought. It helps the group overcome the unwanted influence of prior knowledge, because the most typical way of slaying a new idea would be with the weapons of existing knowledge and tradition. "It would never work (given my preconceptions about the way the world works)."

Delaying criticism does mean that many of the ideas generated will be nonsensical and have no hope of solving the problem, precisely because they don't touch base with what we already know. But this fits with two other principles of brainstorming: generate as many potential solutions as possible in the hope that quantity will lead to quality, and shoot for the wildest ideas possible.

Two analogies shed light on these quantity versus quality suggestions. First, many of us know people whom we admire as exceptional amateur photographers. Viewing their travel pictures is a joy, and we don't shudder when they ask if we want to see slides from their recent trip to Europe. What we may not realize is that they have taken the tedium out of viewing their pictures by only showing us a small fraction of the ones they have actually taken, the very best. When they go on a trip, they take as many photographs as they can. They don't just settle for one shot of a magnificent building. They capture it from different distances and angles, with different parts in and out of focus, with and without tourists, and so on. Like the faithful recorder in a brainstorming group they preserve as many views as they can, even if some may turn out to be supremely dull. Then, rather than boring us with all of the views they have recorded, they select only the very best, the ones that thrill and move us, the ones that capture a special nuance or reveal a truth.

A second analogy comes from nature. The problem all living things must solve is how to survive long enough to reproduce. Unless a species can meet this goal, it will quickly blink out of existence. One way to solve the problem is to produce a small number of high-quality organisms, but another is to produce so many that a few are bound to survive long enough in spite of themselves. Any native Texan will swear that June bugs, which actually begin to appear in April, are nature's ultimate example of solving the survival problem by way of quantity rather than quality. These peanut-sized insects spend their short little lives crashing into windows, bouncing to the ground, and spinning wildly on their backs, buzzing all the while in an annoying

frenzy, like hysterical caricatures of break dancers. Their behavior is so random, it is a wonder how they continue. Yet they are so plentiful, it would be a greater wonder if, just by chance, they all died out.

So it is with brainstorming. If the group can begot a large enough set of ideas, even though most are silly and unworkable, some few will remain that might actually lead to a solution.

The rapid-fire production, the absence of criticism, and the emphasis on a bountiful supply of wild ideas all help people escape the bonds of conventional thinking. In this sense, the procedures are consistent with our view that one path to creativity is to circumvent the influence of existing knowledge.

One additional principle in brainstorming is that participants should "piggyback" on earlier ideas. They can either build on a single suggestion or merge two or more of them. This rule fits perfectly with the emphasis we have placed on conceptual combinations as a source of novel ideas.

Brainstorming has great potential as an aid to developing creative solutions, but it also has some drawbacks. The most serious is that it can actually inhibit productivity. Several well-controlled experiments show that individuals working alone dream up more ideas than the same number of people working together in a group.¹³ This happens because, despite the best of intentions, when people build on earlier ideas, the thinking in the group will naturally tend to flow in a particular direction. Even though participants are encouraged to make a multitude of suggestions, they may inhibit themselves from stating ideas that do not continue moving the group in the same direction. Working by themselves, they would not experience the same inhibition. If the goal really is to propagate a bounty of suggestions, then it might actually be better to have people work alone.

Despite the possible disadvantage of promoting fewer ideas, brainstorming remains the most popular of all creativity training efforts.¹⁴ One reason is that corporations believe it works. Unfortunately they are afflicted with the "comparad-to-what" problem. If a brainstorming group discovers an effective way to

reduce losses related to shoplifting or employee theft, to improve ridership on public transportation, to sell more boxes of a certain cereal, or to improve communication among divisions, it is tough to argue with their success. But the fact remains that we have no way of knowing whether an even better idea would have cropped up by assigning the same number of people to work on the task individually.

A second reason businesses stick with brainstorming is that they are interested in more than just breeding an abundance of ideas. For instance, because brainstorming groups can meet over an extended period of time, the technique can foster the goals of "team building" and nurturing a happy, cohesive work force. Furthermore, these long-standing groups might be more successful at avoiding the pitfalls of groupthink that stymie the groups situated in laboratory settings.

But, for whatever reason they do so, if corporations continue using brainstorming, they ought to exercise it to its fullest potential. Two procedures can help. First, to prevent any one person's ideas from being swept away in the rush down a different path, each group member should write down as many ideas as he or she can think of *prior* to meeting with the group. Before the group narrows its focus, all of these independently generated ideas must be aired.

The second procedure is that each would-be group member should have his or her own thinking skills prior to participating in the group. The quality of solutions produced by brainstorming teams can only be as good as the minds of the individuals who populate the group. If all participants are facile at merging concepts, using analogies and metaphors, envisioning images, pulling back by way of abstraction, and so on, they will be better able to move the group along toward constructive solutions. So even though we have concentrated mostly on how individuals can cultivate mental skills, it is clear that skilled thinkers can enhance group problem solving by exercising their talents in brainstorming sessions.

This chapter has explored the potential usefulness of creative cognition in the world of business; in particular, how to develop creative products, organizations, and marketing strategies. Conceptual combination, abstraction, and careful attention to the mental models of consumers can aid in all of these efforts. Any business concerned with its own capacity to innovate should be sure that its employees have mastered these skills and can bring them to bear on whatever tasks they have to perform. An important challenge is to harness the talents of such individuals and make those part of the larger group effort of the corporation. Those who are aware of how to employ creative cognition are the business workers and administrators who will carry the corporation forward through the ever-changing future.

NOTES

1. We have borrowed the example of this hierarchy from Michael R. Solomon, *Consumer Behavior* (Boston: Allyn & Bacon, 1992).
2. David Green and Valerie Loveluck, "Understanding a Corporate Symbol," *Applied Cognitive Psychology* 8 (1994), pp. 37-47.
3. Deri Jones Yang, "A Shot in the Arm for Sales?" *Business Week*, June 7, 1993, p. 64.
4. William M. Pride & O. C. Ferrell, *Marketing* (Boston: Houghton Mifflin, 1993).
5. Michael Hammer & James Champy, *Reengineering the Corporation* (New York: HarperBusiness, 1993).
6. Hammer & Champy, *Reengineering the Corporation*, p. 32.
7. William E. Hoistad & John L. Duncan, "The Aluminum Beverage Can," *Scientific American* 1994, pp. 48-53.
8. David Gebauer, *Jump Start* (New York: Farrar Straus Giroux, 1990); N. P. Kamran, Kathy R. Rebovo, & Donna L. Ellis, *Dreaming Detroit* (New York: Praeger, 1982).
9. Sandra D. Adelman, "Pump, Pump, Pump at Schwinn," *Business Week*, August 23, 1993, p. 79.

10. Mark Pendergrast, *For God, Country, and Coca-Cola* (New York: Charles Scribner's Sons, 1993).
11. Pendergrast, *For God, Country, and Coca-Cola*, p. 360.
12. The story does have a happy outcome for Coca-Cola. In the end, Coke Classic did regain the lead in the market over Pepsi-Cola. However, the turmoil and initial dip in market share might have been avoided with more careful planning.
13. Michael Diehl & Wolfgang Siroethe, "Productivity Loss in Brainstorming Groups: Toward the Solution of a Riddle," *Journal of Personal and Social Psychology*, 53 (1987), pp. 497-509.
14. Lloyd W. Ferrel, Jr., & Pam Nickolsenko, "The Creative Process: Its Use and Extent of Formalization by Corporations," *Journal of Creative Behavior* 27 (1993), pp. 214-220.



SCIENCE FICTION AND FANTASY WRITING

Stephen Donaldson, the noted science fiction and fantasy author, had a vexing problem, the sort of problem that most writers dread. He had an idea that he wanted to write about, but could not find a suitable way to convey it. He wanted to probe the abstract concept of "unbelief," an unwillingness to accept the possibility that fantasy worlds might exist. But, try as he might, he could not discern the story line, the vehicle that could transport this vague idea from mind to paper.

Unbelief nagged at him. It flirted with him. It poked its head out from behind a tree and then disappeared again, like some coy woodland nymph. But it would not be seized. How Donaldson ultimately captured the idea, and penned an exquisite set of books, provides a classic example of the power of conceptual combination. In this chapter we will take a look at how authors employ that procedure and other techniques in practicing their craft.