Design principles for an innovating company

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Executive Overview

There can be no more formidable challenge for a young company than to learn how to compete in the emerging global technology marketplace. When that company must also run the FDA regulatory gauntlet, falter, and then come back to win big, there is the basis for a good story. When a bench chemist accidentally licked his finger almost twenty years ago in a G.D. Searle lab, there was little reason to suspect that the product which would finally come to market would become one of the most profitable and widely-used food products in U.S. history. This article is not meant to lift the veil on the story behind this product, but to help other U.S. companies learn how to compete on what I call the new playing field for corporate innovation. The commercialization of aspartame, or NutraSweet as it is known, is a story filled with lessons for young technology-intensive companies facing this challenge.

In My View

Aspartame, or NutraSweet as it has become known by its branded name, is a unique product for several reasons. An accidental lab discovery nearly twenty years ago, aspartame had attractive properties compared to sugar and other sweeteners. After a very controversial and torturous regulatory process, G.D. Searle took aspartame to market as the first branded food ingredient. Today, NutraSweet is in over 4,000 products in more than 80 countries, with a level of brand recognition the envy of every major food company. Coca-Cola and Pepsi executives will begrudgingly admit that it made their diet brands a success. NutraSweet did not simply enter the wave of consumer diet consciousness, it dramatically amplified it.

What most people do not know is that it was almost a Japanese product. The sophisticated biotechnology required to produce aspartame was certainly not within G.D. Searle at that time. Searle was a moribund pharmaceutical company with an empty product pipeline, much too diversified, and run by a troika of Searle family members. Ajinomoto Company, the giant Japanese food company, had the technology to produce aspartame and almost beat G.D. Searle scientists to the patent office. The subsequent joint-venture was clearly lop-sided; Ajinomoto controlled the technology and know-how, and G.D. Searle’s fate would be sealed as soon as its use patent lapsed.

But that is not what happened, of course. In a surprising series of events, G.D. Searle managers and scientists bootstrapped the creation of even more efficient production technology than Ajinomoto’s, and learned not just how to produce but to market a product in one of the world’s most competitive industries. The relationship between these two companies today remains close and much more balanced. Both G.D. Searle and The NutraSweet Company, the division formed around aspartame, also came to be lead by an unusually creative group of executives from unusual backgrounds. Don Rumsfeld and John Robson came out of government service and into G.D. Searle. Bob Shapiro, another government
executive and lawyer, but with corporate development experience, became CEO of The NutraSweet Company. Shapiro attracted a group of bright, aggressive, young managers who loved the challenge of playing David to the food industry Goliaths.

Shapiro and his cadres took the company to where it is today. Simplesse, or "fake fat," has followed aspartame, an encouraging sign that there could be Act Two. Monsanto's acquisition of G.D. Searle in 1985 also would, as one happy-ending scenario, bring the financial and technological resources to NutraSweet to assure its future. Wrong. The patent comes off aspartame in 1992, well before Simplesse and other products can have a significant impact. And while Monsanto has indeed helped, Monsanto has its own very real competitive problems. Bob Shapiro, to his credit, was also promoted last year into Monsanto's top executive ranks to help solve some of those problems. But NutraSweet without its charismatic first leader? What could the future offer? Michael Porter once visited the company and depressed everyone by proclaiming the inevitability of the product life cycle; life with a generic product, with its passion for cost controls, was not an appealing vision.

The question was whether the creative, spontaneous "start-up" culture which everyone treasured would have to end so soon due to some immutable force. The NutraSweet Company, like so many meteoric growth companies, was having to question its basic identity and make decisive choices early in its life. The playing field for innovation had radically shifted since aspartame's discovery, not just for NutraSweet but also for every other technology-intensive U.S. company.

The NutraSweet Company understands these challenges and is responding. Its goal is to defy gravity by creating a lean, efficient, and continuously innovating organization that is capable of competing in a global biotechnology market. It certainly would like to do so other than through cost alone. The design principles being used by the company offer invaluable lessons for many other technology-intensive U.S. companies.

The entry of pharmaceutical companies and other "high-tech" companies into the food industry also poses fundamental ethical, political, and social issues. How these companies relate to consumers through their complex technologies, and how governments regulate their innovation processes will determine not just the future of food, but also the public's perception and acceptance of science.

This article gets beyond the purely entertaining side of the NutraSweet story. It identifies seven forces driving the new design principles for innovating companies. It then describes several specific design principles I discovered within The NutraSweet Company. A few sound like homilies because they have received so much attention by other writers. Still others are unique to NutraSweet, and these get greater attention than the others.

NutraSweet struggles to apply its organizing concepts just like every other company. Principles are articulated, experimented with, and rejected when necessary. No one would ever suggest that the company has attained perfection. There are bad, as well as good, experiences from which to learn; NutraSweet is, above all, an active learning system trying to learn from both.

The New Playing Field for Corporate Innovation
The terrain on which technology-intensive companies must compete is being shaped by several paradigm shifts. As paradigm shifts, they imply fundamental changes in the way we view the world and in how individuals, groups, and organizations relate to each other. They set the groundrules or conditions which govern corporate innovation today. Exhibit 1 lists seven of these shifts. A great
many very eloquent authors have explored these shifts, so my goal here is to only relate them to corporate innovation, specifically to NutraSweet.

*From Machine Age to Organic Thinking*

The first fundamental shift is from viewing the universe as a well-ordered machine to that of a highly organic system of dynamic, integrally related parts. It is a shift from reductionism to systems thinking, which paralleled the emergence of the natural sciences, notably biology. Basic to this shift is the recognition that problems need to be understood in terms of their larger context, not reduced to constituent parts that in themselves give no perspective on the entire problem. You gain understanding of a problem by placing it in its larger context.

The shift to more organic, systems thinking has several practical implications. First, organic thinking deemphasizes analytic skills, which stress finding a single right answer, to appreciative skills, which emphasize asking the right question. In a world of infinite information and maximum uncertainty, asking the right question may be more important in directing energies and effort.

In the pharmaceutical and food industries, the question of how safe a product may be depends upon the question being asked. Normal science, in the world of food and drug regulation, never yields a single definitive answer.

Organic thinking places a new product into a larger cultural context of social, political, and economic conditions and forces that determine how it will be used and valued. Aspartame, in this perspective, had social, political, and economic dimensions that transcended its immediate use. It was not simply an artificial sweetener, but a product which fit an emerging life style, posed tremendous technological and scientific uncertainties for the FDA and food companies, and was the economic foundation for a much larger NutraSweet.

Innovators have a responsibility to appreciate as much as possible the larger context in which their new products and services are used. For example, aspartame is not simply an artificial sweetener; it is a sugar substitute. Subtle? Not really, because the economic and social implications are actually tremendous. The market for sugar is many, many times larger than for saccharin. Are there

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many fat Chinese clamoring for an artificial sweetener? No, but offsetting part of China's foreign exchange drain due to sugar imports by building aspartame plants there is a creative possibility when you view yourselves as an alternative to sugar. Internally performing a "social impact analysis" is also a wonderful exercise because it can uncover additional applications and positive spin-off effects. This responsibility is particularly important for the emerging hi-tech food companies of the future like NutraSweet. As Bob Shapiro once said, "Food is where drugs were 100 years ago."

From Monolithic to Pluralistic Models
Inherent in the machine age model is the view of the organization as a bounded fortress with well-defined boundaries between what is inside and what constitutes its environment. The closed-system conceptualization of the organization is fortunately breaking down. The notion of boundaries was a machine age fantasy from the beginning; the organization's boundary is a sieve, at best. The organization is an open system in deep and constant interaction with its environment. As a consequence, companies have stakeholders which claim legitimate interests in the way they conduct their activities.

There is, conversely, the danger that a corporation does not recognize the impact that its stakeholders can have. The American auto industry, for example, has been criticized for being blind to its customers' needs. Ford has made the strongest bid to reconnect with its customers, and has fared much better in terms of its performance than GM or Chrysler over the past few years.

What corporations need to accept is that a different set of skills will be required to effectively compete in such a pluralistic economy. Diverse, co-existing interests dictate development of effective negotiation, conflict management, and communication skills to create shared interests. Confrontation simply does not carry the company as far as it would like. Overall, the shift toward more pluralistic forms of organizational governance means that power sharing is inevitable. American manufacturers are, for example, increasingly working with suppliers and customers to design new products. Such coordination can produce better long-term results than constantly coercing suppliers to lower their prices to a point where they are financially weakened, can no longer innovate, and thus are unable to improve their own supplies.

The NutraSweet story provides several vivid examples of the costs of not collaborating and benefits of collaboration. Playing hard ball with Coca-Cola and Pepsi to get them to adopt a 100 percent formulation at a high price may have worked at the time, yet certainly now has costs associated with it. Customer loyalty is a virtue as patent expiration approaches. On the other hand, the close collaboration between the food companies and G.D. Searle was highly effective in developing the first applications for aspartame and getting through the regulatory process.

From Competition to Collaboration
The costs of a "go it alone" mentality, with its view of the corporation as a fortress, are simply too high for most corporations to continue paying. We have learned from the Japanese that coordinated, long-term, targeted strategies executed across a set of companies and governmental players can be effective in improving the competitiveness of the individual players involved. Collaboration is becoming a core part of corporate strategy, particularly as industries take on global scale.

Michael Porter and Mark Fuller, a Harvard professor and a consultant, respectively, note, for example, that "While coalitions are not new in international..."
competition, their character seems to be shifting. Coalitions are becoming more strategic, through linking major competitors together to compete worldwide.\(^2\)

Olivetti is an excellent example of the importance of collaboration for innovation. Olivetti has had to recognize that it was at a severe competitive disadvantage compared to American giants like IBM. It accepted the idea that it could not work at the leading edge of a technology through internal R&D alone. In 1989 it articulated a radically new strategy regarding innovation. It would become a platform for new technologies and products brought to it by others, thus emphasizing its own marketing and distribution strengths. Olivetti has direct controlling and minority stakes in 200 smaller technology-based companies throughout Europe and the U.S. It will also work with Japanese manufacturers in introducing their Olivetti-branded products into its markets.

While much of the collaboration is occurring among otherwise competitors, there is increasingly close collaboration all along the value-added chain, from suppliers all the way through to customers. If a particular activity within the corporation does not directly contribute to the value of a product or service delivered to a customer, the increasingly prevalent view is to "out source" that activity—i.e., let someone else do it that can provide it less expensively or with better quality. But the net effect of rationalizing the value-added chain is the proliferation of relationships that have to be managed, not just better focused products. Whether we know the true costs and how to effectively manage such complex networks of interdependencies is uncertain.

The corollary to market-based collaboration within the firm is, of course, the idea that divisions and business groups need to collaborate, not compete, in executing strategy. While it is often motivating and efficient to have three manufacturing plants compete on the basis of performance, the competition becomes tremendously dysfunctional when the three plants are integral parts of a larger corporate strategy which requires harmonization of activities. Efficiency, to the loss of effectiveness in penetrating new markets with new products, does not make good strategic sense.

Similarly, competition and conflict between technical and marketing groups can kill the commercialization of an innovation. Corporations deal with the threat of internal competition by introducing a variety of linking mechanisms between the groups involved, offering group-based and multi-functional team rewards, creating cross-training opportunities, and sharing data bases to minimize the barriers created by internal subcultures.

From Structure to Process
The pace of technological and industry change makes the erection of structures of any kind comparable to creating the Maginot Line in anticipation of World War II. The flexible, adaptive, fast company is the one that wins in today's markets. Maneuverability and the ability to have maximum impact at a chosen point in the market can count more than scale. As George Gilder points out in his controversial book, Microcosm, a study of the semiconductor industry, new products have come much more from smaller, entrepreneurial companies, than from the largest of the high technology companies.\(^3\) Gilder is criticized for his support of entrepreneurism in an American industry which must compete against industrial giants like NEC and Sony. Smaller companies, the critics argue, do not have the market clout to penetrate markets deeply enough to sustain share once the Japanese load-on. On the other hand, the larger firms can not create an
internal environment which is flexible and creative enough to allow broad-based, continuous innovation to occur. These larger firms inevitably get hardening of their internal innovation arteries.

This is a complex issue, yet the lingering perception is that large scale leads to hierarchy which, in turn, unintentionally slows innovation. The rapid pace of industrial change diminishes the importance of large scale in penetrating and holding markets with new products. This is, of course, not to say that scale of operation and resources are not important for a company, only that sufficient scale is necessary; excessive scale serves no useful purpose other than to raise overhead costs and slow reaction time.

Information and communication technologies have radically facilitated decision making and speed of response for managers. As another consequence, the movement toward collaborative networks of companies serving a single large customer or an entire market has become possible. What we now see is unitary, well-defined organizational structures giving way to flows of information and services across their boundaries.

Putting large-scale project and program structures in place to manage the innovation process can be useful—say creating a new commercial spacecraft. But managing the innovation process in a dynamic, highly competitive marketplace requires accepting what Bob Waterman calls “stability in motion.”—continuous, incremental change. The design objective is to provide sufficient structure to create a basic order, but to prevent structure from getting in the way of processes which respond more quickly to market needs.

Process is increasingly a substitute for structure. For managers, this means learning how to become excellent process facilitators, including negotiators, communicators, conflict managers, and transition managers with a high tolerance for uncertainty and change. It also means that people, along with their skills, abilities, and commitment, are more important to the company than rules and policies. What a nice prospect!

From Technology Programs to Pulses

The days of programmed and paced introductions of product innovations are over. As the amount of scientific knowledge grows and the technological base expands, the pace of innovation has also accelerated. With more intense competition among companies through technologies, the flow of innovations into markets is becoming continuous, not discrete.

The past century can be characterized by episodic, spaced introductions of technological innovations. The automobile entered the economy and has only been partially replaced by the subsequent introduction of the airplane. There have been improvements in both of these innovations over time, but for autos, at least, these had been planned and consciously paced up until the last decade. Remember as a child the new car unveiling ritual which was experienced with delight each year? Model years now vary from manufacturer to manufacturer, with new models coming into the market as soon as they can be designed and produced.

Newer technologies, such as bioengineering and computers, are also being introduced and improved at paces which give the appearance of a pulsating flow of blood through an artery. Competitive pressures dictate rapid introductions and follow-on product line extensions and modifications. The goal is to ride experience curves as rapidly as possible to reap the benefits of increasingly short product life cycles. New design technologies such as CAD/CAM and close user involvement in the design stage have also accelerated the pace of market entries.
Continuous flows mean being internally organized in ways to work those ideas quickly and effectively through the groups involved. The Japanese have also understood the implications of this paradigm shift for some time. For example, they only take three years to bring a new model to market while U.S. auto makers take five years; the result is fresher and more models in a market.  

For corporations, pulsating technologies mean having a continuous flow of new ideas working internally. Active hunting for new ideas takes place outside the company, as well. Remember, NutraSweet barely got to the patent office ahead of Ajinomoto, which had heard about aspartame at a scientific conference. Staying informed about new developments, whether internally or externally, has taken on strategic importance. Many corporations have created the position of chief technical officer to signal the importance of, and providing a focal point for, the innovation management process.  

From National to Transnational  
Markets and competition are now being defined along global, not domestic, dimensions. Corporate innovation has gone global. Indeed, Bob Shapiro once noted in a conversation that "Molecules don't have nationalities." Rather than viewing the competition in nationalistic terms—a U.S. company against a foreign company—Shapiro is making the point that technological innovation and competition today know no national boundaries.  

From a practical perspective, a global view of competition and innovation leads you to specific decisions. For example, where you locate research facilities is an important aspect of corporate technology strategy, since the location decision determines how quickly product adaptations to local markets can occur, and the foreign investment terms negotiated with host governments. The traditional co-location of corporate headquarters and R&D is antiquated.  

Bob Shapiro's proclamation about molecules poses even more fundamental challenges, however. It suggests that some innovations, perhaps not all, but an important class of technologies like biotechnology, transcend national boundaries. We tend to look at global competition from the perspective of nation state rivalries—Japan versus America, for example—instead of appreciating how those technologies can be developed and deployed for global markets from just about any developed nation.  

The inherent advantage of the U.S. is that it has a very large market to help amortize R&D costs over long production runs, but greater European and Asian market integration is already underway. Steel technology was dependent upon accessibility to ore, coal, a well-developed transportation system, and population base. Biotechnology is not.  

Technological innovations can now emerge anywhere, given sufficiently nurturing conditions. India and Saudi Arabia could, for example, become major players in biotechnology if they decided to give that science high enough national priority. Where the product innovations coming from that technology are introduced is a secondary issue. The important point is that there are many new technologies which simply do not have national allegiances. In the never-ending search for comparative advantage, we have postured technological innovation as a "them versus us" contest among the largest industrialized countries. As the technological infrastructure of some rapidly industrializing countries (the RICs) and newly industrialized countries (the NICs) develops, the action-packed game of technological competition in the next century will welcome a potentially much expanded set of players.
From Short-term to Long-term Thinking

Finally, there is a welcomed shift from economic rationality measured in three-month intervals to strategic performance measured over several years. The past decade in the U.S. has been devastating for corporations trying to execute major transformations. Ed Hennessey, CEO of Allied-Signal, was able to transform the old commodity chemical company he inherited into a major technological player active in several high-technology sectors over an eleven year period. Jack Welch is doing the same thing at General Electric. Motorola and Black & Decker are moving in the same direction.

While wonderful to recount, you have to appreciate how unusual these stories unfortunately are. The number of executives who have had the time and opportunity to execute long-term strategic plans is much smaller than it should be. What is so disturbing is that this pattern is happening in some of our most vital new industries, not older ones. Genentech, for example, sold a sixty percent stake in 1990 to Hoffman LaRoche, a Swiss firm, reportedly in part to allow it to get away from the constant glare of financial analysts and investors who wanted shorter-term results than its management was prepared to give.

The leap-frogging of new technologies in industries such as biotechnology does lead to shorter product life cycles and the rapid movement of companies into and out of markets. Part of the problem is also due to the amazing intolerance of the financial markets for long-term corporate strategy. The flood of readily available debt, and prospects of significant financial gain through leveraged buy-outs, hostile raids, and break-ups over the past two decades were enough to disrupt any CEO's long-term plans. No industry has been immune, and no corporation could afford not to have a defensive strategy mapped. A great many corporations were able to use mergers and acquisitions strategically, such as GE and Allied, but others either assumed more debt than they could handle or became victims to raiders.

The overall net result for the nation was diminished attention to R&D and internal innovation at a time when global competition was demanding more. R&D spending has fallen consistently since 1984, according to a Business Week sponsored study in August 1989. After climbing 12.7 percent annually from 1976 through 1985, the inflation adjusted rate for 1989 is only 1 percent versus 1.3 percent in 1988 and 3.7 percent in 1987. Not good news.

More encouraging are three recent trends. First, the pace of hostile mergers and acquisitions is way off and will remain so due to uneasiness about excessive leverage. This gives companies a little more relief from hostile takeovers. Second, the role models American corporations have chosen are corporations in countries which promote long-term strategy, specifically the Japanese. The perception is if foreign firms succeed for this reason, so can our companies. Third, corporate executives are also starting to listen to a few business academicians and executives who are preaching long-term strategy. Michael Porter from Harvard, for example, emphasizes how financial measures of performance are not necessarily good measures of strategic health. For Jack Welch, the performance of GE's businesses is measured in terms of its standings in its respective industries, not near-term ROI.

Several technology-based corporations, NutraSweet among them, are realizing that making something gives them control over their futures. Licensing technology away, or getting it from someone else, creates interdependencies and prevents the development of internal innovation capacity. There is nothing inherently unique about the technology licensor; there is certainly something unique about the
company that markets its own creations which were built from a deep technological competence. For NutraSweet, it was uncomfortable having the young company’s fate in the hands of a large Japanese company, regardless how benevolent that company may be at that moment. Today, you simply do not put the future of your company into the hands of others. Period.

Whether these three trends are enough to lengthen executive time horizons and stiffen resolve is not clear. Corporations will need years to recover from the abuses and excesses of the past two decades. They at least appreciate the need to change.

The Competitive Wedge

It is to Bob Shapiro’s credit, as well as his top managers, that they recognized the impact these seven shifts have for their company. Market discontinuities are created and mistakes made by large competitors due to these shifts. But guiding a company across this terrain is still a formidable task. What helps make it possible is a number of design principles that provide a way of articulating the shifts in terms and ways the company can manage. NutraSweet has not mastered all of these principles. Nor are principles ever permanent; new ones emerge and others die.

NutraSweet’s leadership has managed a very open process of articulating, experimenting, and getting buy-in for these principles. Whether a plant supervisor or Bob Shapiro, people are asked to think and talk about their predicament and choices. This is done through discussion and through very symbolic actions. For example, Shapiro’s molecules comment publicly expresses the company’s perceived domain for competition. Still, no one sits around all day talking grand theory; there is a strong action-bias within the company. Instead, a state of mind and an approach to problem solving is encouraged which is difficult to characterize. Sir Geoffrey Vickers would perhaps call it an “appreciative system,” or an “ecological system” which interprets, orders, and develops a “population of ideas” that conflict, compete, and mutually support each other within the company.

To help understand what was going on, I found it necessary to organize my thinking through a model that I call the “competitive wedge.” There are at least eight key design principles in use around NutraSweet, and there are likely others in various stages of discovery and decline. Bob Shapiro, along with several key managers, helped articulate many of these; others I discovered while wandering through the company. Some are actively debated internally about their value. The competitive wedge’s components are illustrated in Exhibit 2.

The competitive wedge represents the unique configuration of the company’s products and services, structure and systems, people, and technologies focused with maximum energy and impact upon the company’s chosen markets. Each of these wedge parts can be perfected as a basis for competitive advantage, but only when they are collectively harnessed do they provide lasting, maximum impact. The challenge to the company’s leadership is to harmoniously integrate each of these edges to form a true wedge. Three design principles need to be mentioned before exploring the model’s components since they are pervasive to the entire model. The first principle deals with the scope of the markets attacked by the company.

Compete Globally to Succeed Locally

For NutraSweet, its basic premise has always been that is must “Compete Globally to Succeed Locally.” The company’s competitive strategy is inherently global in scope due to the competitive structure of the food industry and scale of its opportunities and competitors. NutraSweet’s competitive strategy accepts the
The lesson for other companies is that they really do not have a competitive strategy these days unless it is global in scope.

Interdependence between domestic and international markets. For example, competitive pressure must be applied to European markets not just due to the growth potential of those markets, but also to keep competitors off-balance within the U.S. To serve The Coca-Cola Company, NutraSweet will co-locate aspartame finishing plants in Europe and Brazil. The lesson for other companies is that they really do not have a competitive strategy these days unless it is global in scope.

The domestic U.S. marketplace is large and thus offers some protection for a young innovating company, but only for a short time. The competitive playing field for technology-intensive, innovative companies is global, not domestic.

Innovate, Innovate, Innovate Continuously
A bias toward creative change must be pervasive in each of the model's components. The other wedge components are eventually compromised when one is less developed than the others. Indeed, the need for innovation is so strong that NutraSweet's second and even more basic design principle is "Innovate, Innovate, Innovate Continuously." The types of statements that you hear within the company
It is not exaggerating to say that the competitive wedge is like a spearpoint aimed at a specific market. It has to be as sharp as possible to penetrate deeply.

Preserve A Bias Toward Growth
The emphasis upon global scale and continuous innovation reflects a third design principle which Bob Shapiro calls “Preserve a Bias Toward Growth.” Innovation is dedicated to creating frontiers for people to expand into. He notes that “simply doing more of what you’re already doing isn’t it. You grow into the domain of the unknown to create spaces for something interesting to happen.”

Growth gives flexibility and freedom. No growth limits flexibility and choice. It is the biological axiom of “grow or die,” whether organizationally or individually, wedded to competitively driven innovation. You can not retain the creative talent needed to grow the company if the company does not continue to grow. Growth is not necessary just for financial performance reasons. Growth provides the challenge and opportunity for the organization to express its full potential.

Balancing and Focusing The Wedge
The company must not only develop, but must also integrate the components in the competitive wedge to achieve maximum focus and impact. If one of these components is weak, or they are collectively not focused as well as possible, then the wedge is not keen enough to create and sustain competitive advantage in a market. A particularly strong part of the wedge may give temporary advantage, but sustained competitive advantage requires balanced strength across the other wedge parts, as well. It is not exaggerating to say that the competitive wedge is like a spearpoint aimed at a specific market. It has to be as sharp as possible to penetrate deeply.

For example, General Motors has invested billions of dollars in advanced manufacturing technologies, yet has apparently still underinvested in other components such as people. As a result, GM may have very advanced manufacturing technology, but it also has the highest operating costs in the auto industry. Its competitive wedge components are still out of balance.

The Leader's Role
The challenge to the company’s leadership is to harness these components to provide focus and achieve maximum impact. The leader meets this challenge by first defining a vision for the company that weds its desired culture (i.e., its operant values and beliefs) with its long-term competitive strategy. Culture and strategy are melded to bring about the company’s vision. The leader, and the focused culture and strategy expressed by the company’s vision, represent the spear shaft. They provide the driving force to the other wedge components.

There is very little that is mystical about a vision for a company. The concept of “vision” has received a great deal of attention over the past few years, and the common mistake is to separate the vision statement from the process used in creating it. Defining a vision does not just happen; it is the result of a deep, long assessment of the company’s competencies, prospects and aspirations, and choices. It thus reflects, to greater or lesser degrees, its members shared expectations about their company’s future. A shared vision is one which sufficiently meshes different sets of expectations to create focused action.
Dr. Egon Zehnder, founder of my firm and a close confidant of many corporate leaders, once commented that the leader must be able to relate or interpret the vision from any number of possible perspectives. A vision is “multidimensional” when it can be interpreted by all individuals and groups within the organization. Each individual and group must interpret what that vision means for them and whether that interpretation meets their aspirations.

Young companies are direct reflections of their leaders. What Bob Shapiro had been able to do was be an eloquent, consistent interpreter of the company’s vision, helping lead the debate about its operational implications for the company as business conditions change. While Bob offered his own interpretations of that vision to provide guidance, he left it sufficiently ambiguous to preserve room for individual employee interpretation. He advanced only a few central themes or common issues at a time to let employees focus their thinking and action. This process he calls creating “organic resolution”—shared commitment to a limited set of common, central issues that allows decentralized action.

**Intensely-Focused Cultures**

Getting the sharpest focus to the wedge requires tighter integration between the company’s culture and its competitive strategy than perhaps commonly accepted. One view of the relationship between culture and strategy is that choices of strategy are conditioned and confined by the company’s culture. Bob Miles, author of *Coffin Nails and Corporate Strategy*, notes how the strong cultures of the tobacco companies dictated what strategies these companies considered as responses to increasingly hostile business environments.\(^8\)

On the other hand, the implicit assumption today is that the company’s strategy drives its culture. Culture is increasingly seen as a variable changed to support the execution of major shifts in corporate strategy. Jack Welch at GE can set the objective of a business being number one or two in its respective market, but he must also cultivate a culture which values “speed, simplicity, and self-confidence” to help achieve that business objective. This is done by streamlining work and management systems, encouraging self-expression, and a host of other tangible actions which impact the value and belief systems operating within those businesses. No small feat, but the important point is that culture appears to be serving corporate strategy, not vice versa.

GE and NutraSweet both have what I call intensely focused cultures. Neither strategy nor culture totally drives the other; they are actively managed to make sure that they reinforce each other. The values and beliefs inherent in culture are supportive of the company’s strategy. Through its execution, the strategy satisfies those values and confirms its beliefs. For example, Mariann Jelinek and Kay Schoonhoven in their book, *The Innovation Marathon*, note how strategy is pervasive in the cultures of the technology-driven semiconductor companies they studied. In an industry in which costs are routinely driven down twenty five percent a year, getting everyone committed to the company’s competitive strategy is essential. For example, strategy, they note, is a common topic and subject of conversion throughout those companies.\(^9\)

The view that creative organizations maximize autonomy, individual expression and open experimentation, and prefer egalitarian management simply is not true in such intensely focused, innovation-driven, competitive companies. Effectively balancing and integrating the competitive wedge’s core elements requires greater centralization and control by top management than that advocated in earlier, more naive views of creative organizations. The early days at Apple Computer, for example, certainly characterized the loosely organized, highly creative companies assumed by the popular view of innovation.
The high competitive stakes in global markets preclude totally decentralized, autonomous behavior, whether now in Apple under John Scully or NutraSweet when it was under Bob Shapiro. NutraSweet is increasingly disciplined about the behaviors which it accepts, but the range of those behaviors is still very broad. Management’s task is to encourage some degree of conformity across individuals, groups, and divisions through the sharing of the company’s strategy and culture, while still flirting with anarchy. There is a dynamic tension between stability and change that is managed with a strong bias toward change. Order without rigidity is the goal.

The controls used in companies with intensely focused cultures vary tremendously from more bureaucratic organizations. While bureaucratic control is achieved through rules, policies, and hierarchies, control can also be achieved through the internalization of the company’s basic values and beliefs expressed in its design principles. There are rules, policies, and hierarchy, to be sure, but they are recognized as having both pluses and significant minuses.

Operationally, what this means is that the prevailing state of affairs and way of doing things is continuously questioned and consciously subverted when it no longer helps execute strategy. It means placing much less emphasis upon formal structures and much more emphasis on the processes that monitor, evaluate, and help make the changes that impact performance. The leader is process designer and facilitator.

If there is anything the NutraSweet story illustrates, it is the inseparability of products and services.

The Products and Services Edge
The products and services component is concerned with which products are created and how they are supported with customers. If there is anything the NutraSweet story illustrates, it is the inseparability of products and services.

The more complex and technology-intensive a product, the more supporting services add value and become essential. The obvious issue for NutraSweet is how its product and services will be valued by the market after the patent falls in 1992. The patent, branded ingredient strategy, perceived high product safety and quality, heavy direct advertising, and customer support had initially helped position aspartame in its market. The question is whether the company has, in effect, simply educated and prepared the market for generic aspartame after 1992.

More problematic is the challenge of becoming and staying the low-cost producer of aspartame when its culture has been oriented more toward start-ups, new product innovation, and market positioning. It is a change in mind set which some managers have had difficulty making, but must be constantly reinforced. Again, a Shapiro comment illustrates the message: “We’ve now got to get the machine guns pointed down the hill, not up the hill.” Vivid, symbolic communication and behavior is a norm.

The Structure and Systems Edge
The company was restructured from a functional to more classic multidivisional structure in 1988. The creation of a Simplesse division and New Ventures group was recognition that the company was at several points in its life all at once. Issues found in more mature companies were co-existing with issues related to new product innovation. A more robust structure and systems were needed to organize these issues.

In every instance, however, the goal has been to keep structure and systems lean and as uncluttered as possible. To preserve flexibility while providing structure, NutraSweet uses three absolutely critical design principles. I think of these almost
as general mandates that ask all employees to "Work Against Boundaries," "Create, Not Just React, To The Environment," and "Nurture Self-Designing Behavior." These design principles sprang from many managers’ early negative experiences in highly structured, bureaucratic organizations.

Restated, the goal is to organize around issues, as well as tasks.

Work Against Boundaries
"Work Against Boundaries" literally means accepting a minimal amount of structure between work units and hierarchical levels, while always understanding the negative consequences of the mental and operational boundaries which emerge. Boundaries, like those found in a living cell, serve a function; they buffer the internal functions from external disturbances and provide identity to the organism. But boundaries need to be highly permeable to let information flow. The task is to allow sufficient boundaries to give individuals and work groups an identity, but to keep them focused outward, not inward. It means promoting collaboration and cooperation to manage shared issues and challenges. Restated, the goal is to organize around issues, as well as tasks.

There is, of course, an organization chart which shows groups organized around core tasks and products, but the organization chart does not show the incessant interaction that occurs around issues which cut across groups.

There is a metaphysical aspect to this design principle. Boundaries are not just organizational, but also mental. The admonition is to test limits and the way problems and choices are framed. Reframing the company’s scope from being an artificial sweetener company to a sugar replacement company was a first step. And now with Simplesse, it is becoming a technology intensive, health-oriented food company illustrating this principle in practice.

There is also a level of irreverence tolerated in the company that many CEOs would find uncomfortable. The "tomato poster" was a classic example. Bob Shapiro wanted to invite comments from employees, both supportive and negative, and allowed a poster of himself to be created that showed a big orange tomato splashed across part of his picture with the inscription "Give Me Your Best Shot." The poster was meant to symbolize that no one is to be idolized or stood apart from others in the organization. Hierarchy has a function, but it should never create boundaries between employees that prevent candid, direct communication. Rather than create confusion—some of which is desirable, anyway—the idea is to create an openness to new ways of doing things.

Create, Not Just React, to the Environment
A corollary design principle is also used to free-up thinking. Don Rumsfeld and John Robson were firmly committed to the idea that the company had to "Create, Not Just React, To The Environment." The unheard of strategy of suing the FDA to break the approval stalemate in 1981, and the successful "one-legged Hopi" amendment to Congressional legislation which extended the patent’s life, are two examples of how G.D. Searle chose to create, not just react, to its environment. It meant proactively engaging the environment to shape conditions and forces which impacted the company.

NutraSweet learned the need for more proactive management of its environment the hard way. The regulatory debacle demonstrated the need to develop a more sophisticated government, consumer, and legal affairs management capacity. The company has begun sponsoring industry conferences about food industry issues and continues funding on-going clinical studies of its products to make sure it stays out in front of issues. By challenging its environment, NutraSweet demonstrates the fundamental competitive advantage which proactive companies gain; they are able to set everyone else’s agenda.
Nurture Self-Designing Behavior

The "Nurture Self-Designing Behavior" principle encourages employees to create opportunity space in their own job and work group. Rob Kazanjian, an Emory professor, and I were trying to figure out just what we had heard after a two-day trip to NutraSweet's headquarters early in 1989, when Rob made the observation that people were apparently being asked to "design themselves"—the "selves" were being asked to design their own jobs.

The traditional work design process centers around the division and grouping of tasks and activities based on their interdependencies with each other into jobs and groups. The organization's technology, distribution of power and resources, and a number of other factors influence the division of labor which occurs. Conversely, self-designing behavior springs from the individual and group's capacities and motivation for assuming greater responsibility and authority. The desire is to expand job scope by making tasks more whole and integrated.

While it once made sense to group tasks together, the tendency was to create job positions and work groups on the basis of a smaller, not larger, set of activities to be performed. A level of responsibility and authority would be assigned to a job and group which minimized its impact on performance if tasks are not performed. It is an ageless game of dividing and redividing tasks and activities that are, in fact, fundamentally whole. As Bob Shapiro said about the typical bureaucratic approach, "You end up dividing jobs so small that you only get small people. They never have a picture of the whole." Over time, people tend to become what their job descriptions say.

As a solution, the strategy is to keep jobs as large as possible to force people to exercise judgment and recognize priorities. For example, rather than simply hiring more market researchers to perform the company's market research internally, external market research firms are extensively used to minimize the number of internal staff. Doing so makes economic sense, but the more basic motivation is to keep people focused on larger priorities and issues, not managing a legion of staff. You can manage issues and priorities or you can manage the structure you create.

The basic goal is to expand job scope as much as possible for an individual and group. Employees are encouraged to enlarge their circle of responsibility and authority to the greatest extent they believe possible. This process has been called empowering. The assumption is that people want responsibility and can handle it. An inability to share power creates morale and turnover problems, and employees who can not grow into positions of greater authority over time. Empowering people also assumes that they, like their company, are in the "process of becoming"—of growing and changing—and narrow job scopes confine both them and the company.

The big question is how can you empower individuals and groups while still controlling their performance? When has the circle of responsibility and authority expanded too far? The goal should be to let job scope expand up to the point that it is productive to do so. There is no tangible rule or point for knowing when that point has been reached. The danger, of course, is that the individual or group becomes overloaded and makes mistakes and burns-out. Confusion about responsibilities can also increase and activities fall through the cracks.

The answers to these questions are not obvious. One of the early plant managers suggested that empowering people requires as a prerequisite the leader having tremendous self-confidence. It then requires time and experience with the
individual, and trust. Active, multi-directional flows of communication, and effective team work are essential for trust. But what is trust, after all? It means that people behave in consistent ways, that they do not have to question each other’s motives or act from self-interest alone. It also means that risk-taking is encouraged, not punished. If employees enlarge their circles by taking on additional responsibilities, but make mistakes, then the company’s response becomes a crucial indicator of trust.

Trust is a concept I encountered more than once in innovative companies. Some companies feel comfortable using soft, squishy concepts like trust as a way of managing. Trust is not just an outcome of managing, but a way of managing. It is used in place of rules and hierarchy.

These concepts are extremely difficult for traditional organization designers to accept. Designers get uncomfortable when they do not know how to measure concepts. Nonetheless, managers find soft concepts like trust essential for managing a complex, rapidly changing work environment. These concepts provide the basis for empowering people and groups so that they may voluntarily fill the spaces created by growth and change. They build commitment and support creativity.

At a business level, self-designing behavior means that no two businesses should be designed and operated the same way if they spring from different technologies and are targeted against different markets. Perhaps this sounds obvious. However, a great many new businesses created within today’s largest, most well-known companies smother their born by inappropriate structure and processes. The point is that tremendous flexibility is needed in designing a new business. There should not be a cookie-cutter approach to growing businesses that imposes a “one best way” solution on the new business. Within NutraSweet, the technology and market conditions that Simplesse faced were fundamentally different from aspartame. Simplesse was rightly recognized as a separate business, not just another product in a product line to be managed with a prevailing organization design. The goal is to let Simplesse as a division emerge and unfold based upon its inherent differences and potential. Within the seed is the latent company.

The People Edge
It is an understatement to say that the type and skills of people within a young innovative company are critical to success. The company and employees both live at the edge of their capabilities. People must be willing and able to accept unusual amounts of responsibility and overwhelming ambiguity. NutraSweet and other intensely focused companies can be incredibly hard on people. As a result, there is perhaps nothing more important than the selection, development, and separation processes used.

NutraSweet has one of the deepest gene pools of management and scientific talent within the industry. Providing the resources to develop this pool, and the right incentives to retain its members, is an important challenge. There was an early attempt at selecting employees for the “right attitude,” not just skills, when the division was first formed. Some of the traits sought were hard to quantify, such as flexibility, entrepreneurial spirit, and an ability to handle uncertainty, yet these traits were believed important at the plant level because these were all start-up situations.

Whether these same traits are as important now is a question currently being asked. As the need for different types of employees becomes clear, and other employees can no longer grow to meet the demands being created, a very difficult area for work becomes creating a separation policy which minimizes both harm and guilt to the individual and to the company.
Because people are so critical to success, note how many of the design principles described so far relate to people, not just markets or company structure.

Principles such as "Nurture Self-Designing Behavior," for example, not only try to assure that work will be performed effectively, but that the work will be challenging. The goal has been to create a culture and climate which appeals to people's minds and hearts. Given the competitive pressures the company now faces, Shapiro deeply believes that, "We can win only if there are people who are prepared to fight for this company. They have to see something worth fighting for to make this happen." That is the essence of the people component in NutraSweet.

The Technology Edge

The last wedge component in the competitive wedge model refers to more than the tangible process technology of a company. It includes its entire knowledge and skill base, as well. The collective know-how of the company resides within its people. With this definition in mind, the technology component is particularly strong in NutraSweet. The company works ceaselessly in making sure it has achieved competitive advantage with respect to its technologies.

A great deal of attention has been focused on this task by technology-intensive American companies. In the case of semiconductors, competitive advantage may well have been lost. In other industries like biotechnology, the Japanese are trying to gain position, but American companies are still in dominant positions. How the U.S. can preserve, even rebuild, advantage is the question, and the prescriptions run the gamut of improving quality, service, manufacturing productivity, and designing creative organization structures and management practices. Obviously, initiatives in all of these areas are important.

Without question, NutraSweet's pharmaceutical heritage is a major asset in creating and preserving its market position. Its R&D activities are disciplined, well-funded, and professionally staffed. The process technologies within the company are supported with experienced NutraSweet technicians and Monsanto engineers with deep process technology expertise. There is no other comparable company in the U.S. food industry. Then there is Ajinomoto, both as an ally and as a model.

Embrace Your Technology

Still, a competitive edge in technology was never assured for NutraSweet. Indeed, back at the beginning G.D. Searle had almost lost the use patent for aspartame to Ajinomoto. NutraSweet was totally dependent upon Ajinomoto until the bootlegged development of its own technology. The ability to actually innovate in large scale process technology paved the way for funding additional experiments that have given NutraSweet a major technological advantage.

While Ajinomoto technology, and later Monsanto technology, provided a solid foundation for NutraSweet, the lesson is to regain control of your future by regaining control of your technology. The new imperative within NutraSweet is "Don't Just Accept, Embrace Your Technology." Where some companies would license away technologies, NutraSweet is totally convinced that its future depends upon its ability to master its own technology and control it, even regain control if
control had been lost. It literally means not just knowing your technology, but knowing it like no other company.

A company can dominate a market with its command of the relevant technologies used to compete in that market. The company needs to have more than what is increasingly called a technology strategy. The strategic use of technology means that technology is integral to strategy, even that technology shapes strategy. NutraSweet has used its technology strategically both with aspartame and with Simplesse. But it has also done so creatively. Aspartame became NutraSweet brand aspartame, the first branded ingredient in food industry history. Simplesse has become another branded ingredient which will be marketed through multiple marketing channels, unlike the typical ingredient. The company has wisely invested in its technology edge and understands its strategic importance.

Designing An Innovating Company—A Summary
The basic premise is that successful innovating firms are characterized by the design principles they use to compete in chosen markets. The principles serve as governing assumptions and groundrules for directing the attention, energies, and resources of the company to a chosen end. The competitive wedge model is a simple way of expressing the need for organizing these design principles for maximum impact.

An important aspect of the competitive wedge model is the need to not just develop one or two components, but all of them. Their development needs to be balanced because they are so interdependent with each other. A company can stumble onto a great product and gain initial market success, but that success will be short-lived if the other components are not also developed. Successful, sustained competitive advantage accrues to those companies that work ceaselessly to create balance and articulate design principles to guide them.

Endnotes
The issues discussed in this article are explored in greater depth by Joseph McCann in his most recent book: Sweet Success: How NutraSweet Created a Billion Dollar Business (Business One—Irwin, 1990).
1 Russell L. Ackoff, Redesigning the Future (New York: John Wiley & Sons, 1974).

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