

Marketers play a key role in the new-product process by identifying and evaluating new-product ideas and working with R&D and others in every stage of development. This chapter provides a detailed analysis of the new-product development process. Chapter 21 considers how marketers can tap into global markets as another source of long-term growth.

::: Challenges in New-Product Development

A company can add new products through acquisition or development. The acquisition route can take three forms. The company can buy other companies, it can acquire patents from other companies, or it can buy a license or franchise from another company. Swiss food giant Nestlé increased its presence in North America via its acquisition of such diverse brands as Carnation, Hills Brothers, Stouffer's, Ralston Purina, Dreyer's Ice Cream, and Chef America.²

The development route can take two forms. The company can develop new products in its own laboratories, or it can contract with independent researchers or new-product development firms to develop specific new products. We can identify six categories of new products:³

1. ***New-to-the-world products*** – New products that create an entirely new market.
2. ***New product lines*** – New products that allow a company to enter an established market for the first time.
3. ***Additions to existing product lines*** – New products that supplement established product lines (package sizes, flavors, and so on).
4. ***Improvements and revisions of existing products*** – New products that provide improved performance or greater perceived value and replace existing products.
5. ***Repositionings*** – Existing products that are targeted to new markets or market segments.
6. ***Cost reductions*** – New products that provide similar performance at lower cost.

Less than 10 percent of all new products are truly innovative and new to the world. These products involve the greatest cost and risk because they are new to both the company and the marketplace. W.L. Gore, best known for its durable Gore-Tex outdoor fabric, has innovated breakthrough new products in a number of diverse areas—guitar strings, dental floss, medical devices, and fuel cells. It has adopted several principles to guide its new-product development:⁴

1. ***Work with potential customers.*** Its thoracic graft, designed to combat heart disease, was developed in close collaboration with physicians.
2. ***Let employees choose projects.*** Few actual product leaders and teams are appointed. Gore likes to nurture “passionate champions” who convince others a project is worth their time and commitment. The development of the fuel cell rallied over 100 of the company's 6,000 research associates.
3. ***Give employees “dabble” time.*** All research associates spend 10 percent of their work hours developing their own ideas. Promising ideas are pushed forward and judged according to a “Real, Win, Worth” exercise. Is the opportunity real? Can we win? Can we make money?
4. ***Know when to let go.*** Sometimes dead ends in one area can spark an innovation in another. Elixir acoustic guitar strings were a result of a failed venture into bike cables. Even successful ventures may have to move on. Glide shred-resistant dental floss was sold to Procter & Gamble because Gore-Tex knew that retailers would want to deal with a company selling a whole family of health care products.

Most new-product activity is devoted to improving existing products. At Sony, over 80 percent of new-product activity is actually devoted to modifying and improving existing prod-



Improving existing products: Print ad for the new Gillette M3Power shaver for men.

ucts. Gillette frequently updates its razor systems: It launched the new M3Power wet shaver for men and Venus Divine for women in 2004.⁵ In many categories, it is becoming increasingly difficult to identify blockbuster products that will transform a market; but continuous innovation to better satisfy consumer needs can force competitors to play catch-up.⁶

BLACKBERRY

Indispensable to subscribers including Jeb Bush, Sarah Jessica Parker, and Jack Welch, Research in Motion's (RIM) Blackberry, introduced in 1999, has become almost synonymous with wireless e-mail. E-mail is automatically directed to Blackberry as it is going to the desktop and can be answered with an intuitive thumb-operated keyboard. The corporate goal is to "enable wireless e-mail whenever and on whatever device people want." Adding new features such as voice and speakerphones, brighter-color screens, backlit keyboards, and international roaming have fueled explosive growth. Its fanatical appeal has led some to dub the product "CrackBerries." With a subscriber base reaching 2 million in 2004, it's no surprise that the stock price increased tenfold during the previous year.⁷

Launching new products as brand extensions into related product categories is one means of broadening the brand meaning. Nike started as a running-shoe manufacturer but now competes in the sports market with all types of athletic shoes, clothing, and equipment. Armstrong World Industries moved from selling floor coverings to ceilings to total interior surface decoration. Product innovation and effective marketing programs have allowed these firms to expand their "market footprint."

In an economy of rapid change, continuous innovation is necessary. Most companies rarely innovate, some innovate occasionally, and a few innovate continuously. In the last

category, Sony, 3M, Charles Schwab, Dell Computer, Sun Microsystems, Oracle, Southwest Airlines, Maytag, Costco, and Microsoft have been stock-price gain leaders in their respective industries.⁸ These companies have created a positive attitude toward innovation and risk taking; they have routinized the innovation process; they practice teamwork; and they allow their people to experiment and even fail.

Companies that fail to develop new products are putting themselves at risk. Their existing products are vulnerable to changing customer needs and tastes, new technologies, shortened product life cycles, and increased domestic and foreign competition. New technologies are especially threatening.

Most established companies focus on *incremental innovation*. Newer companies create *disruptive technologies* that are cheaper and more likely to alter the competitive space. Established companies can be slow to react or invest in these disruptive technologies because they threaten their investment. Then they suddenly find themselves facing formidable new competitors, and many fail.⁹ To ensure that they don't fall into this trap, incumbent firms must carefully monitor the preferences of both customers and noncustomers over time and uncover evolving, difficult-to-articulate customer needs.¹⁰

PEPSICO

Determined to develop new products to reflect changing consumer tastes and demographics, food and beverage giant PepsiCo adds more than 200 product variations to its global portfolio each year, ranging from Quaker Soy Crisps to Gatorade Xtremo Thirst Quencher. Chairman and CEO Steven Reinmund believes that innovation is the key to consistent double-digit earnings growth: "Innovation is what consumers are looking for, particularly in the small, routine things of life." PepsiCo emphasizes new flavors and healthier ingredients with existing brands. It has also successfully launched new product lines in the United States such as Sabritas chips, a \$100 million success brought over from its Mexican subsidiary, and Propel fitness water, which achieved similar sales success only a year after its launch.¹¹

At the same time, new-product development can be quite risky. Texas Instruments lost \$660 million before withdrawing from the home computer business; RCA lost \$500 million on its videodisc players; FedEx lost \$340 million on its Zap mail; DuPont lost an estimated \$100 million on a synthetic leather called Corfam; and the British-French Concorde aircraft never recovered its investment.¹² Even these amounts are paltry compared to the \$5 billion Iridium fiasco (see "Marketing Insight: Iridium Disconnects with Global Customers").

New products continue to fail at a disturbing rate. Recent studies put the rate at 95 percent in the United States and 90 percent in Europe.¹³ New products can fail for many reasons: ignoring or misinterpreting market research; overestimating market size; high development costs; poor design; incorrect positioning, ineffective advertising, or wrong price; insufficient distribution support; and competitors who fight back hard.

Several factors also tend to hinder new-product development:

- **Shortage of important ideas in certain areas.** There may be few ways left to improve some basic products (such as steel or detergents).
- **Fragmented markets.** Companies have to aim their new products at smaller market segments, and this can mean lower sales and profits for each product.
- **Social and governmental constraints.** New products have to satisfy consumer safety and environmental concerns.
- **Cost of development.** A company typically has to generate many ideas to find just one worthy of development, and often faces high R&D, manufacturing, and marketing costs.
- **Capital shortages.** Some companies with good ideas cannot raise the funds needed to research and launch them.
- **Faster required development time.** Companies must learn how to compress development time by using new techniques, strategic partners, early concept tests, and advanced marketing planning.
- **Shorter product life cycles.** When a new product is successful, rivals are quick to copy it. Sony used to enjoy a three-year lead on its new products. Now Matsushita will copy the product within six months, leaving hardly enough time for Sony to recoup its investment.



MARKETING INSIGHT

IRIDIUM DISCONNECTS WITH GLOBAL CUSTOMERS

In the late 1990s, Motorola and several partners launched Iridium, a \$5 billion global satellite-based wireless telephone system. Motorola's engineers envisioned 66 telecommunications satellites that would circle the earth and make it possible for consumers to place and receive calls with one phone anywhere in the world. Motorola's aim was to establish a universal standard for wireless telephony.

Yet in August 1999, Iridium had to file for bankruptcy because it was unable to meet a \$90 million bond payment, and in March 2000, a judge ordered that the bankrupt system be shut down. Motorola was forced to pull the plug on the project. Now, it's clear that the project's sponsors did a poor job of thinking through the marketing issues.

1. The Iridium handset weighed about one pound; most cell phones weigh a couple of ounces. The handset was shaped like a brick and was awkward to carry or pack in a briefcase. The user had to carry a bag of attachments to achieve full functionality. Transmission problems included frequent incomplete calls and lost calls, and the voice quality was poorer than callers were used to on their cellular phones.
2. Iridium was originally launched at \$3,000 and eventually came down to \$1,500. Worse, airtime charges ranged from \$4 to \$9 a minute, whether the caller was phoning in his own city or calling from a Borneo jungle.
3. Although the phone was touted to be workable anywhere, it could not be used inside buildings or in moving cars. Users had

to have a clear path between the handset and the orbiting satellites. Furthermore, large areas in Europe, Asia, and Africa lacked service.

4. Iridium budgeted \$180 million for promotion. Its advertising campaign showed a man in a heavy parka pulling a sled in a desolate, snowbound place. His phone suddenly rings: He has contact with the outside world. This ad campaign was supplemented with a direct-mail campaign and a strong public relations program, but all this promotion needed to be followed up by competent personal selling. This was the hardest challenge, because prospects would raise questions about price, service breakdowns, and the bulky handset, and often conclude that the benefits were not worth the price.
5. Motorola chose selling partners in other parts of the world who often lacked marketing skills. Although the promotion campaign generated about 1.5 million inquiries, most were not answered or not answered quickly enough.

Senior management set a drop-dead launch date of September 23, 1998, but had to delay this until November 1. Even then, the company still had problems with the product, service, distribution, support, and finances. With all these complications, no wonder the project never attracted more than 50,000 buyers. The lesson: No amount of promotion can make a success out of a poorly designed product plagued with poor quality and poor service.

Sources: Jonathan Sidener, "Iridium's Adventure Over Satellite Phone System Ordered Shut Down," *Arizona Republic*, March 18, 2000; Kevin Maney, "3,000 Gadget Might Be Globe-Trotters Best Friend," *USA Today*, September 17, 1998; Leslie Cauley, "Iridium's Downfall," *Wall Street Journal*, August 18, 1999; Eric M. Olson, Stanley F. Slater, and Andrew J. Czaplewski, "The Iridium Story: A Marketing Disconnect?" *Marketing Management* (Summer 2000): 54–57.

What can a company do to develop successful new products? Cooper and Kleinschmidt found that the number-one success factor is a unique, superior product. Such products succeed 98 percent of the time, compared to products with a moderate advantage (58 percent success) or minimal advantage (18 percent success). Another key factor is a well-defined product concept. The company carefully defines and assesses the target market, product requirements, and benefits before proceeding. Other success factors are technological and marketing synergy, quality of execution in all stages, and market attractiveness.¹⁴ (See "Marketing Memo: Lessons for New Product Success.")

Organizational Arrangements

Once a company has carefully segmented the market, chosen its target customers, identified their needs, and determined its market positioning, it is better able to develop new products. Many companies today use *customer-driven engineering* to design new products. Customer-driven engineering attaches high importance to incorporating customer preferences in the final design.

New-product development requires senior management to define business domains, product categories, and specific criteria. General Motors has a hefty \$400 million benchmark it must apply to new car models—this is what it costs to get a new vehicle into production.¹⁵ One company established the following acceptance criteria:

- The product can be introduced within five years.
- The product has a market potential of at least \$50 million and a 15 percent growth rate.



MARKETING MEMO

LESSONS FOR NEW-PRODUCT SUCCESS

Strolling the aisles at Robert McMath's New Product Showcase and Learning Center is like being in some nightmare version of a supermarket. There is Gerber food for adults—pureed sweet-and-sour pork and chicken Madeira—microwaveable ice cream sundaes, parsnip chips, aerosol mustard, Ben-Gay aspirin, and Miller Clear Beer. How about Richard Simmons Dijon Vinaigrette Salad Spray, garlic cake in a jar, and Farrah shampoo?

McMath's unusual showcase represents \$4 billion in product investment. Behind each of the 80,000 products on display are squandered dollars and hopes. From them he has distilled dozens of lessons for an industry that, by its own admission, has a very short memory. McMath, a former marketer for Colgate-Palmolive, has now put his unique insights into a book called *What Were They Thinking?* Here are a few of the marketing lessons McMath espouses:

- **The value of a brand is its good name, which it earns over time.** People trust it to deliver a consistent set of attributes. Do not squander this trust by attaching your good name to something totally out of character. Louis Sherry No Sugar Added

Gorgonzola Cheese dressing was everything that Louis Sherry, known for its rich candies and ice cream, should not be: sugarless, cheese, and salad dressing.

- **Me-too marketing is the number-one killer of new products.** Pepsi is one of the few survivors among dozens of other brands that have challenged Coke for more than a century. Ever hear of Toca-Cola? Coco-Cola? Yum-Yum Cola? French Wine of Cola? How about King-Cola, "the royal drink"?
- **People usually do not buy products that remind them of their shortcomings.** Gillette's For Oily Hair Only shampoo flopped because people did not want to confess that they had oily hair; nor do they wish to advertise their faults and foibles to other people by carrying such products in their grocery carts.
- **Some products are too different from the products, services, or experiences consumers normally purchase.** You can tell that some innovative products are doomed as soon as you hear their names: Toaster Eggs, Cucumber Antiperspirant Spray, Health-Sea Sea Sausage.

Sources: Paul Lukas, "The Ghastliest Product Launches," *Fortune*, March 16, 1996, p. 44; Jan Alexander, "Failure Inc.," *Worldbusiness* (May–June 1996): 46; Ted Anthony, "Where's Farrah Shampoo? Next to the Salsa Ketchup," *Marketing News*, May 6, 1996, p. 13. Bulleted points are adapted from Robert M. McMath and Thom Forbes, *What Were They Thinking? Marketing Lessons I've Learned from Over 80,000 New-Product Innovations and Idiocy* (New York: Times Business, 1998), pp. 22–24, 28, 30–31, and 129–130.

- The product would provide at least 30 percent return on sales and 40 percent on investment.
- The product would achieve technical or market leadership.

Budgeting for New-Product Development

Senior management must decide how much to budget for new-product development. R&D outcomes are so uncertain that it is difficult to use normal investment criteria. Some companies solve this problem by financing as many projects as possible, hoping to achieve a few winners. Other companies apply a conventional percentage of sales figures or spend what the competition spends. Still other companies decide how many successful new products they need and work backward to estimate the required investment.

Table 20.1 shows how a company might calculate the cost of new-product development. The new-products manager at a large consumer-packaged-goods company reviewed the

TABLE 20.1

Finding One Successful New Product
(Starting with 64 new Ideas)

Stage	Number of Ideas	Pass Ratio	Cost per Product Idea	Total Cost
1. Idea screening	64	1:4	\$ 1,000	\$ 64,000
2. Concept testing	16	1:2	20,000	320,000
3. Product development	8	1:2	200,000	1,600,000
4. Test marketing	4	1:2	500,000	2,000,000
5. National launch	2	1:2	5,000,000	10,000,000
			\$5,721,000	\$13,984,000

results of 64 ideas. Only one in four, or 16, passed the screening stage. It cost \$1,000 to review each idea at this stage. Half of these ideas, or eight, survived the concept-testing stage, at a cost of \$20,000 each. Half of these, or four, survived the product-development stage, at a cost of \$200,000 each. Half of these, or two, did well in the test market, at a cost of \$500,000 each. When these two ideas were launched, at a cost of \$5 million each, only one was highly successful. Thus the one successful idea cost the company \$5,721,000 to develop.

In the process, 63 other ideas fell by the wayside. The total cost for developing one successful new product was \$13,984,000. Unless the company can improve the pass ratios and reduce the costs at each stage, it will have to budget nearly \$14 million for each successful new idea it hopes to find. If top management wants four successful new products in the next few years, it will have to budget at least \$56 million ($4 \times \14 million) for new-product development.

Organizing New-Product Development

Companies handle the organizational aspect of new-product development in several ways.¹⁶ Many companies assign responsibility for new-product ideas to *product managers*. But product managers are often so busy managing existing lines that they give little thought to new products other than line extensions. They also lack the specific skills and knowledge needed to develop and critique new products. Kraft and Johnson & Johnson have *new-product managers* who report to category managers. Some companies have a *high-level management committee* charged with reviewing and approving proposals. Large companies often establish a *new-product department* headed by a manager who has substantial authority and access to top management. The department's major responsibilities include generating and screening new ideas, working with the R&D department, and carrying out field testing and commercialization.

3M, Dow, and General Mills often assign new-product development work to *venture teams*. A **venture team** is a cross-functional group charged with developing a specific product or business. These "intrapreneurs" are relieved of their other duties and given a budget, a time frame, and a "skunkworks" setting. *Skunkworks* are informal workplaces, sometimes garages, where intrapreneurial teams attempt to develop new products.

Cross-functional teams can collaborate and use concurrent new-product development to push new products to market.¹⁷ Concurrent product development resembles a rugby match, with team members passing the new product back and forth as they head toward the goal. Using this system, the Allen-Bradley Corporation (a maker of industrial controls) was able to develop a new electrical control device in just two years, as opposed to six years under its old system.

Cross-functional teams help to ensure that engineers are not just driven to create a "better mousetrap" when potential customers do not really need or want one. Some possible criteria for staffing cross-functional new-product venture teams include:¹⁸

- **Desired team leadership style and level of expertise.** The more complex the new-product concept, the greater the desired expertise.
- **Team member skills and expertise.** New-venture teams for Aventis, part of a pharmaceutical, agricultural, and chemical conglomerate, contain people with expertise in chemistry, engineering, market research, financial analysis, and manufacturing.
- **Level of interest in the particular new-product concept.** Is there interest or, even better, a high level of ownership and commitment (a "concept champion")?
- **Potential for personal reward.** What motivates individuals to want to participate in this effort?
- **Diversity of team members.** This includes race, gender, nationality, breadth of experience, depth of experience, and personality. The greater the diversity, the greater the range of viewpoints and decision-making potential.

3M, Hewlett-Packard, Lego, and many other companies use the *stage-gate system* to manage the innovation process.¹⁹ The process is divided into stages, and at the end of each stage is a gate or checkpoint. The project leader, working with a cross-functional team, must bring a set of known deliverables to each gate before the project can pass to the next stage. To move from the business plan stage into product development requires a convincing market research study of consumer needs and interest, a competitive analysis, and a technical appraisal. Senior managers review the criteria at each gate to judge whether the project deserves to move to the next stage. The gatekeepers make one of four decisions: *go*, *kill*,

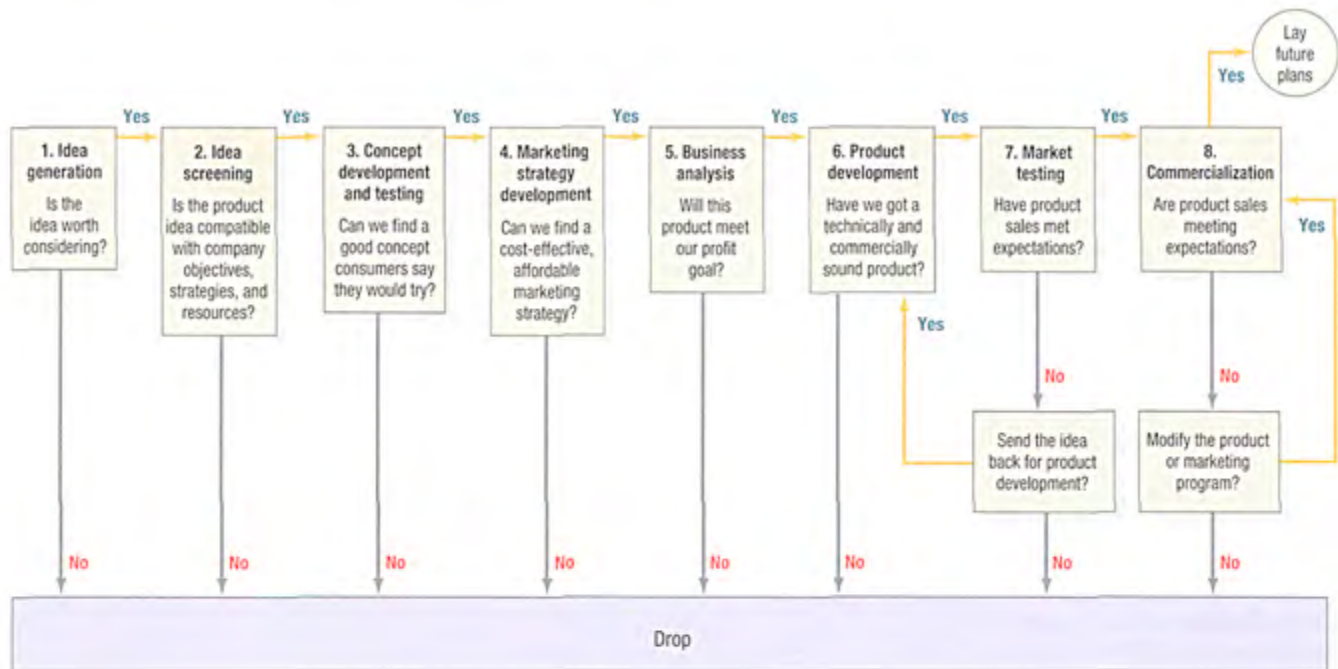


FIG. 20.1 The New-Product Development Decision Process

hold, or recycle. Stage-gate systems make the innovation process visible to all involved and clarify the project leader's and team's responsibilities at each stage.²⁰

The stages in the new-product development process are shown in Figure 20.1. Many firms have multiple, parallel sets of projects working through the process, each at a different stage.²¹ The process can be depicted as a *funnel*: A large number of initial new product ideas and concepts are winnowed down to a few high-potential products that are ultimately launched. But the process is not always linear. Many firms use a *spiral development process* that recognizes the value of returning to an earlier stage to make improvements before moving forward.

ELI LILLY

Recognizing that 90 percent of experimental drugs fail, Eli Lilly has established a corporate culture that looks at failure as an inevitable part of discovery. If a drug fails at its intended use, Lilly scientists are taught to look for new uses. Lilly often assigns a team of doctors and scientists to analyze every compound that fails at any stage in a human clinical trial. Many of Lilly's drug successes actually started out as failures. Evista was a failed contraceptive that became a \$1 billion-a-year drug for osteoporosis. Stattera was unsuccessful as an antidepressant, but became a top seller for attention deficit/hyperactivity disorder. One promising cardiovascular drug in development started as an asthma project.²²

We now look at the marketing challenges arising at each of the eight stages.

::: Managing the Development Process: Ideas

Idea Generation

The new-product development process **starts with the search for ideas**. Some marketing experts believe that the greatest opportunities and highest leverage with new products are found by uncovering the best possible set of unmet customer needs or technological innovation.²³ New-product ideas can come from interacting with various groups and from using

creativity-generating techniques. (See "Marketing Memo: Ten Ways to Great New-Product Ideas.")

INTERACTING WITH OTHERS Ideas for new products can come from many sources, such as customers, scientists, competitors, employees, channel members, and top management.

Customer needs and wants are the **logical place to start the search**. One-on-one interviews and focus group discussions can **explore product needs and reactions**. Griffin and Hauser suggest that conducting 10 to 20 in-depth experiential interviews per market segment often uncovers the vast majority of customer needs.²⁴

Procter & Gamble emphasizes observational techniques with its customers. Brand marketers there spend at least 12 hours a month with consumers in their homes, watching how they wash dishes, clean floors, and brush teeth and asking them about their habits and sources of frustration. They also have on-site labs such as a diaper-testing center where dozens of mothers bring their babies to be studied. This close scrutiny has led to several new-product successes.

PROCTER & GAMBLE

To develop its Cover Girl Outlast all-day lip color, P&G tested the product on nearly 30,000 women: It invited 500 of them to come to its labs each morning to apply the lipstick, record their activities, and return eight hours later so it could measure remaining lip color. The activities, dubbed "torture tests" by P&G, ranged from eating spaghetti to kickboxing to showering. The product comes with a tube of glossy moisturizer that women can reapply on top of their color—without having to look at a mirror. The blockbuster product quickly became the market leader.²⁵

Technical companies can learn a great deal by studying customers who make the most advanced use of the company's products and who recognize the need for improvements before other customers do.²⁶ Microsoft studied 13- to 24-year-olds—the NetGen—and developed its threedegrees software product to satisfy their instant messaging needs.²⁷ (For the special case of high-tech products, see "Marketing Insight: Developing Successful High-Tech Products.")

Employees throughout the company can be a source of ideas for improving production, products, and services. **Toyota** claims its employees submit 2 million ideas annually (about 35 suggestions per employee), over 85 percent of which are implemented. Kodak, Milliken, and other firms give monetary, holiday, or recognition awards to employees who submit the best ideas.

Companies can also find good ideas by **researching competitors' products and services**. They can find out what customers like and **dislike about competitors' products**. They can buy their competitors' products, take them apart, and build better ones. Company sales representatives and intermediaries are a particularly good source of ideas. These groups have firsthand exposure to customers and are often the first to learn about competitive developments.

Top management can be another major source of ideas. Some company leaders, such as the late Edwin H. Land, former CEO of Polaroid, or Andy Grove of Intel, took personal responsibility for technological innovation in their companies. **New-product ideas can also come from inventors, patent attorneys, university and commercial laboratories, industrial consultants, advertising agencies, marketing research firms, and industrial publications.** However, although ideas can flow from many sources, their chances of receiving serious attention often depend on someone in the organization taking the role of product champion.



A blockbuster product: Cover Girl Outlast all-day lip color. The product comes with a tube of moisturizer to be applied on top of the color.

MARKETING MEMO

TEN WAYS TO GREAT NEW-PRODUCT IDEAS

1. Run informal sessions where groups of customers meet with company engineers and designers to discuss problems and needs and brainstorm potential solutions.
2. Allow time off—scouting time—for technical people to putter on their own pet projects. 3M allows 15 percent time off; Rohm & Haas allows 10 percent.
3. Make a customer-brainstorming session a standard feature of plant tours.
4. Survey your customers: Find out what they like and dislike in your and competitors' products.
5. Undertake "fly-on-the-wall" or "camping out" research with customers, as do Fluke and Hewlett-Packard.
6. Use iterative rounds: a group of customers in one room, focusing on identifying problems, and a group of your technical people in the next room, listening and brainstorming solutions. The proposed solutions are then tested immediately on the group of customers.
7. Set up a keyword search that routinely scans trade publications in multiple countries for new-product announcements.
8. Treat trade shows as intelligence missions, where you view all that is new in your industry under one roof.
9. Have your technical and marketing people visit your suppliers' labs and spend time with their technical people—find out what is new.
10. Set up an idea vault, and make it open and easily accessed. Allow employees to review the ideas and add constructively to them.

Source: Adapted from Robert Cooper, *Product Leadership: Creating and Launching Superior New Products* (New York: Perseus Books, 1998).

CREATIVITY TECHNIQUES Here is a sampling of techniques for stimulating creativity in individuals and groups.²⁸

■ **Attribute listing.** List the attributes of an object, such as a screwdriver. Then modify each attribute, such as replacing the wooden handle with plastic, providing torque power, adding different screw heads, and so on.

■ **Forced relationships.** List several ideas and consider each one in relation to each other one. In designing new office furniture, for example, consider a desk, bookcase, and filing cabinet as separate ideas. One can then imagine a desk with a built-in bookcase or a desk with built-in files or a bookcase with built-in files.

■ **Morphological analysis.** Start with a problem, such as "getting something from one place to another via a powered vehicle." Now think of dimensions, such as the type of platform (cart, chair, sling, bed), the medium (air, water, oil, rails), and the power source (compressed air, electric motor, magnetic fields). By listing every possible combination, one can generate many new solutions.

■ **Reverse assumption analysis.** List all the normal assumptions about an entity and then reverse them. Instead of assuming that a restaurant has menus, charges for food, and serves food, reverse each assumption. The new restaurant may decide to serve only what the chef bought that morning and cooked; may provide some food and charge only for how long the person sits at the table; and may design an exotic atmosphere and rent out the space to people who bring their own food and beverages.

■ **New contexts.** Take familiar processes, such as people-helping services, and put them into a new context. Imagine helping dogs and cats instead of people with day care service, stress reduction, psychotherapy, animal funerals, and so on. As another example, instead of hotel guests going to the front desk to check in, greet them at curbside and use a wireless device to register them.



A cyber café: cafeteria + Internet.

■ **Mind-mapping.** Start with a thought, such as a car, write it on a piece of paper, then think of the next thought that comes up (say Mercedes), link it to car, then think of the next association (Germany), and do this with all associations that come up with each new word. Perhaps a whole new idea will materialize.

Increasingly, new-product ideas arise from **lateral marketing** that combines two product concepts or ideas to create a new offering. Here are some successful examples:

- Gas station stores = gas stations + food
- Cyber cafés = cafeteria + Internet
- Cereal bars = cereal + snacking
- Kinder Surprise = candy + toy
- Sony Walkman = audio + portable

Idea Screening

A company should motivate its employees to submit new ideas to an **idea manager** whose name and phone number are widely circulated. Ideas should be written down and reviewed each week by an **idea committee**. The company then **sorts the proposed ideas into three groups: promising ideas, marginal ideas, and rejects**. Each promising idea is researched by a committee member, who reports back to the committee. The surviving ideas then move into a full-scale screening process. In screening ideas, the company must avoid two types of errors.

A **DROP-error** occurs when the company dismisses an otherwise good idea. It is extremely easy to find fault with other people's ideas (Figure 20.2). Some companies shudder when they look back at ideas they dismissed or breathe sighs of relief when they realize how close they came to dropping what eventually became a huge success. This was the case with the television show *Friends*.

FRIENDS

The NBC situation comedy *Friends* enjoyed a 10-year run from 1994 to 2004 as a perennial ratings powerhouse. But the show almost didn't see the light of the day. According to an internal NBC research report, the pilot episode was described as "not very entertaining, clever, or original" and was given a failing grade, scoring 41 out of 100. Ironically, the pilot for an earlier hit sit-com, *Seinfeld*, also was rated as "weak," although the pilot for the medical drama *ER* scored a healthy 91. Courtney Cox's Monica was the *Friends* character that scored best with test audiences, but characters portrayed by Lisa Kudrow and Matthew Perry were deemed to have marginal appeal, and the Rachel, Ross, and Joey characters scored even lower. Adults 35 and over in the sample found the characters as a whole, "smug, superficial, and self-absorbed."²⁹

A **GO-error** occurs when the company permits a poor idea to move into development and commercialization. An **absolute product failure** loses money; its sales do not cover variable costs. A **partial product failure** loses money, but its sales cover all its variable costs and some of its fixed costs. A **relative product failure** yields a profit that is less than the company's target rate of return.

The purpose of screening is to drop poor ideas as early as possible. The rationale is that product-development costs rise substantially with each successive development stage. Most companies require new-product ideas to be described on a standard form that can be reviewed by a new-product committee. The description states the product idea, the target market, and the competition, and roughly estimates market size, product price, development time and costs, manufacturing costs, and rate of return.

The executive committee then reviews each idea against a set of criteria. Does the product meet a need? Would it offer superior value? Can it be distinctively advertised? Does the company have the necessary know-how and capital? Will the new product deliver the expected sales volume, sales growth, and profit?

The surviving ideas can be rated using a **weighted-index method** like that in Table 20.2. The first column lists factors required for successful product launches, and the second column assigns importance weights. The third column scores the product idea on a scale from 0 to 1.0, with 1.0 the highest score. The final step multiplies each factor's importance by the



"I've got a great idea!"



"It won't work here."



"We've tried it before."



"This isn't the right time."



"It can't be done."



"It's not the way we do things."



"We've done all right without it."



"It will cost too much."



"Let's discuss it at our next meeting."

FIG. 20.2

Forces Fighting New Ideas

Source: With permission of Jerold Panas, Young & Partners, Inc.



MARKETING INSIGHT

DEVELOPING SUCCESSFUL HIGH-TECH PRODUCTS

High tech covers a wide range of industries—telecommunications, computers, consumer electronics, biotech, software. Radical innovations carry a high level of risk and typically hurt the company's bottom line, at least in the short run. The good news is that success can create a greater sustainable competitive advantage than that which might come from more ordinary products.

One way to define the scope of high tech is by its common characteristics:

- **High technological uncertainty:** Scientists working on high-tech products are never sure they will function as promised and be delivered on time.
- **High market uncertainty:** Marketers are not sure what needs the new technology will meet. How will buyers use Interactive TV? Which DVD format will prevail after Toshiba's introduction of HD (high definition) DVD in 2005?
- **High competitive volatility:** Will the strongest competition come from within the industry or from outside? Will competitors rewrite the rules? What products will this new technology replace?
- **High investment cost, low variable cost:** Many high-tech products require a large up-front investment to develop the first unit, but the costs fall rapidly on additional units. The cost of developing a new piece of software is very high, but the cost of distributing it in a CD-ROM is relatively low.
- **Short life:** Most high-tech products must be constantly upgraded. Competitors will often force the innovator to produce a second generation before recouping its investment on the first generation.

- **Finding funding sources for such risky projects is not easy:** Companies must create a strong R&D/marketing partnership to pull it off. Few reliable techniques exist for estimating demand for radical innovations. Focus groups will provide some perspectives on customer interest and need, but high-tech marketers will have to use a probe-and-learn approach based on observation of early users and collection of feedback on their experiences.

High-tech marketers also face difficult questions related to the marketing mix:

- **Product:** What features and functions should they build into the new product? Should manufacturing be done in-house or be outsourced?
- **Price:** Should the price be set high? Would a low price be better in order to sell more quickly and go down the experience curve faster? Should the product be almost given away to accelerate adoption?
- **Distribution:** Is the product best sold through the company's own sales force or should it be put in the hands of agents, distributors, and dealers? Should the company start with one channel or build multiple sales channels early?
- **Communication:** What are the best messages to convey the basic benefits and features of the new product? What are the best media for communicating these messages? What sales promotion incentives would drive early interest and purchase?

Source: For further ideas, see Jakki Mohr, *Marketing of High-Technology Products and Innovations*, 2nd ed. (Upper Saddle River, NJ: Prentice Hall, 2005).

product score to obtain an overall rating. In this example, the product idea scores .69, which places it in the "good idea" level. The purpose of this basic rating device is to promote systematic evaluation and discussion. It is not supposed to make the decision for management.

As the idea moves through development, the company will constantly need to revise its estimate of the product's overall probability of success, using the following formula:

TABLE 20.2

Product-Idea Rating Device

Product Success Requirements	Relative Weight (a)	Product Score (b)	Product Rating (c = a × b)
Unique or superior product	.40	.8	.32
High performance-to-cost ratio	.30	.6	.18
High marketing dollar support	.20	.7	.14
Lack of strong competition	.10	.5	.05
Total	1.00		.69 ^a

^aRating scale: .00–.30 poor; .31–.60 fair; .61–.80 good. Minimum acceptance rate: .61

Overall	Probability	Probability of	Probability of
probability of =	of technical ×	commercialization ×	economic
success	completion	given technical	success given
	completion	commercialization	

For example, if the three probabilities are estimated as .50, .65, and .74, respectively, the overall probability of success is .24. The company then has to judge whether this probability is high enough to warrant continued development.

::: Managing the Development Process: Concept to Strategy

Attractive ideas must be refined into testable product concepts. A *product idea* is a possible product the company might offer to the market. A *product concept* is an elaborated version of the idea expressed in consumer terms.

Concept Development and Testing

CONCEPT DEVELOPMENT Let us illustrate concept development with the following situation: A large food-processing company gets the idea of producing a powder to add to milk to increase **its nutritional value and taste**. This is a product idea, but consumers do not buy product ideas; they buy product concepts.

A product idea can be turned into several concepts. The first question is: Who will use this product? The powder can be aimed at infants, children, teenagers, young or middle-aged adults, or older adults. Second, what primary benefit should this product provide? Taste, nutrition, refreshment, energy? Third, when will people consume this drink? Breakfast, mid-morning, lunch, mid-afternoon, dinner, late evening? By answering these questions, a company can form several concepts:

- **Concept 1.** An instant breakfast drink for adults who want a quick nutritious breakfast without preparation.
- **Concept 2.** A tasty snack drink for children to drink as a midday refreshment.
- **Concept 3.** A health supplement for older adults to drink in the late evening before they go to bed.

Each concept represents a **category concept** that defines the product's competition. An instant breakfast drink would compete against bacon and eggs, breakfast cereals, coffee and pastry, and other breakfast alternatives. A tasty snack drink would compete against soft drinks, fruit juices, and other thirst quenchers.

Suppose the instant-breakfast-drink concept looks best. The next task is to show where this powdered product would stand in relation to other breakfast products. Figure 20.3(a) uses the two dimensions of cost and preparation time to create a **product-positioning map** for the breakfast drink. An instant breakfast drink offers low cost and quick preparation. Its nearest competitor is cold cereal or breakfast bars; its most distant competitor is bacon and eggs. These contrasts can be utilized in communicating and promoting the concept to the market.

Next, the product concept has to be turned into **a brand concept**. Figure 20.3(b) is a brand-positioning map showing the current positions of three existing brands of instant breakfast drinks. The company needs to decide how much to charge and how calorific to make its drink. The new brand would be distinctive in the medium-price, medium-calorie market or in the high-price, high-calorie market. The company would not want to position it next to an existing brand, unless that brand is weak or inferior.

CONCEPT TESTING Concept testing involves **presenting the product concept to target consumers and getting their reactions**. The concepts can be presented symbolically or physically. The more the tested concepts resemble the final product or experience, the more dependable concept testing is.

(a) Product-positioning Map (Breakfast Market)



(b) Brand-positioning Map (Instant Breakfast Market)



FIG. 20.3

Product and Brand Positioning

In the past, creating physical prototypes was costly and time-consuming, but computer-aided design and manufacturing programs have changed that. Today firms can use **rapid prototyping** to design products (for example, small appliances or toys) on a computer, and then produce plastic models of each. Potential consumers can view the plastic models and give their reactions.³⁰ Companies are also using **virtual reality to test product concepts**. Virtual reality programs use computers and sensory devices (such as gloves or goggles) to simulate reality.

Concept testing entails presenting consumers with an elaborated version of the concept. Here is the elaboration of concept 1 in our milk example:

Our product is a powdered mixture that is added to milk to make an instant breakfast that gives the person all the needed nutrition along with good taste and high convenience. The product would be offered in three flavors (chocolate, vanilla, and strawberry) and would come in individual packets, six to a box, at \$2.49 a box.

After receiving this information, researchers measure product dimensions by having consumers respond to the following questions:

1. **Communicability and believability** – Are the benefits clear to you and believable? If the scores are low, the concept must be refined or revised.
2. **Need level** – Do you see this product solving a problem or filling a need for you? The stronger the need, the higher the expected consumer interest.
3. **Gap level** – Do other products currently meet this need and satisfy you? The greater the gap, the higher the expected consumer interest. The need level can be multiplied by the gap level to produce a *need-gap score*. A high need-gap score means that the consumer sees the product as filling a strong need that is not satisfied by available alternatives.
4. **Perceived value** – Is the price reasonable in relation to the value? The higher the perceived value, the higher the expected consumer interest.
5. **Purchase intention** – Would you (definitely, probably, probably not, definitely not) buy the product? This would be high for consumers who answered the previous three questions positively.
6. **User targets, purchase occasions, purchasing frequency** – Who would use this product, and when and how often will the product be used?

Respondents' answers indicate whether the concept has a broad and strong consumer appeal, what products this new product competes against, and which consumers are the best targets. The need-gap levels and purchase-intention levels can be checked against norms for the product category to see whether the concept appears to be a winner, a long shot, or a loser. One food manufacturer rejects any concept that draws a definitely-would-buy score of less than 40 percent.

CONJOINT ANALYSIS Consumer preferences for alternative product concepts can be measured through **conjoint analysis**, a method for deriving the utility values that consumers attach to varying levels of a product's attributes.³¹ Respondents are shown different hypothetical offers formed by combining varying levels of the attributes, then asked to rank the various offers. Management can identify the most appealing offer and the estimated market share and profit the company might realize.

Green and Wind have illustrated this approach in connection with developing a new spot-removing, carpet-cleaning agent for home use.³² Suppose the new-product marketer is considering five design elements:

- Three package designs (A, B, C—see Figure 20.4)
- Three brand names (K2R, Glory, Bissell)
- Three prices (\$1.19, \$1.39, \$1.59)
- A possible *Good Housekeeping* seal (yes, no)
- A possible money-back guarantee (yes, no)

Although the researcher can form 108 possible product concepts ($3 \times 3 \times 3 \times 2 \times 2$), it would be too much to ask consumers to rank 108 concepts. A sample of, say, 18 contrasting

product concepts can be chosen, and consumers would rank them from the most to the least preferred.

The marketer now uses a statistical program to derive the consumer's utility functions for each of the five attributes (see Figure 20.5). Utility ranges between zero and one; the higher the utility, the stronger the consumer's preference for that level of the attribute. Looking at packaging, we see that package B is the most favored, followed by C and then A (A hardly has any utility). The preferred names are Bissell, K2R, and Glory, in that order. The consumer's utility varies inversely with price. A *Good Housekeeping* seal is preferred, but it does not add that much utility and may not be worth the effort to obtain it. A money-back guarantee is strongly preferred.

The consumer's most desired offer would be package design B, with the brand name Bissell, selling at the price of \$1.19, with a *Good Housekeeping* seal and a money-back guarantee. We can also determine the relative importance of each attribute to this consumer—the difference between the highest and lowest utility level for that attribute. The greater the difference, the more important the attribute. Clearly, this consumer sees price and package design as the most important attributes, followed by money-back guarantee, brand name and, a *Good Housekeeping* seal.

When preference data are collected from a sufficient sample of target consumers, the data can be used to estimate the market share any specific offer is likely to achieve, given any assumptions about competitive response. The company, however, may not launch the market offer that promises to gain the greatest market share because of cost considerations. The most customer-appealing offer is not always the most profitable offer to make.

Under some conditions, researchers will collect the data not with a full-profile description of each offer, but by presenting two factors at a time. For example, respondents may be shown a table with three price levels and three package types and asked which of the nine combinations they would like most, followed by which one they would prefer next, and so on. They would then be shown a further table consisting of trade-offs between two other variables. The trade-off approach may be easier to use when there are many variables and possible offers. However, it is less realistic in that respondents are focusing on only two variables at a time.

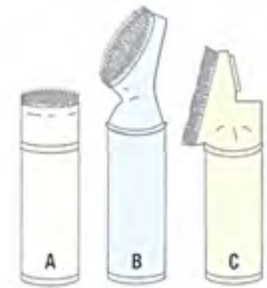


FIG. 20.4

Samples for Conjoint Analysis

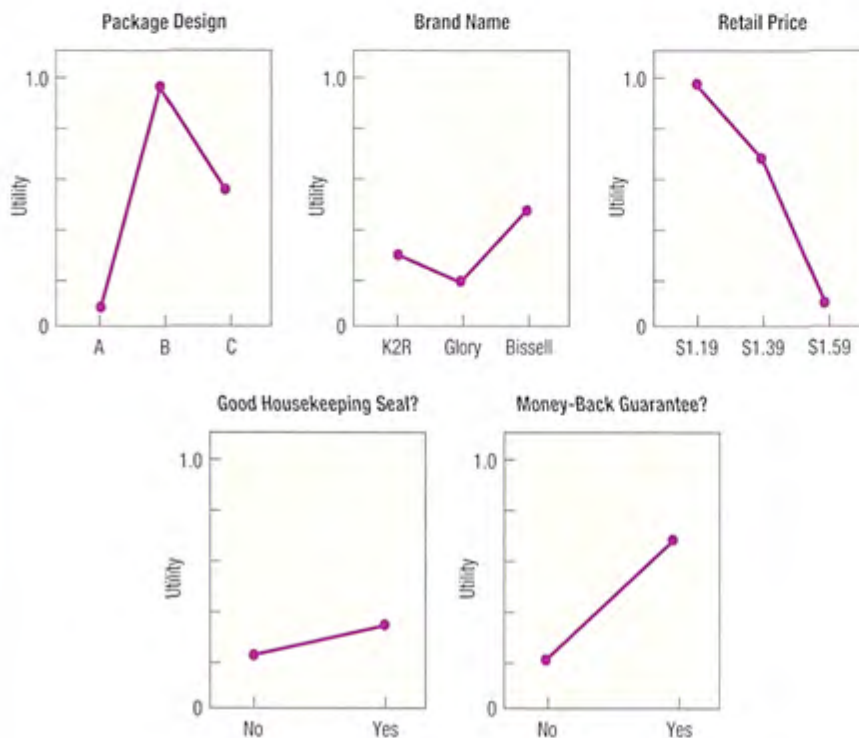
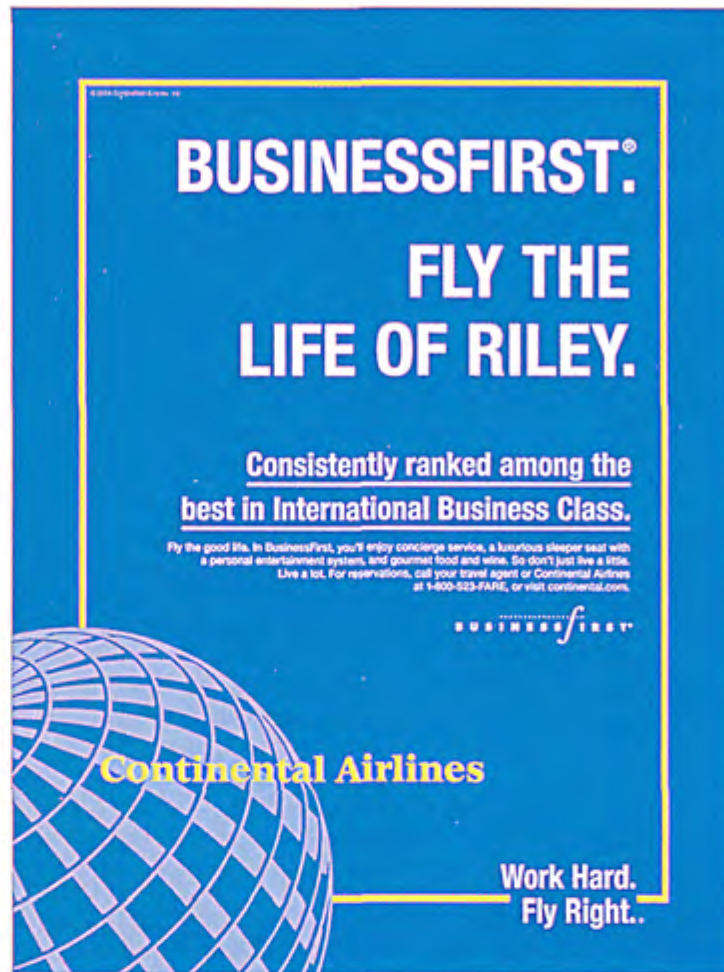


FIG. 20.5

Utility Functions Based on Conjoint Analysis

An ad for Continental Airlines Business First service, the kind of travel service for which airlines often do conjoint analysis.



BUSINESSFIRST.®

FLY THE LIFE OF RILEY.

Consistently ranked among the best in International Business Class.

Fly the good life. In BusinessFirst, you'll enjoy concierge service, a luxurious sleeper seat with a personal entertainment system, and gourmet food and wine. So don't just live a little. Live a lot. For reservations, call your travel agent or Continental Airlines at 1-800-825-FARE, or visit continental.com.

BUSINESSFIRST

Continental Airlines

Work Hard. Fly Right.™

Conjoint analysis has become one of the most popular concept-development and testing tools. Marriott designed its Courtyard hotel concept with the benefit of conjoint analysis. Other applications have included airline travel services, ethical drug design, and credit card features.

Marketing Strategy

Following a successful concept test, the new-product manager will develop a preliminary strategy plan for introducing the new product into the market. The plan consists of three parts. The first part describes the **target market's size, structure, and behavior; the planned product positioning; and the sales, market share, and profit goals sought** in the first few years:

The **target market** for the instant breakfast drink is families with children who are receptive to a new, convenient, nutritious, and inexpensive form of breakfast. The company's brand will be positioned at the higher-price, higher-quality end of the instant-breakfast-drink category. The company will aim initially to sell 500,000 cases or 10 percent of the market, with a loss in the first year not exceeding \$1.3 million. The second year will aim for 700,000 cases or 14 percent of the market, with a planned profit of \$2.2 million.

The second part outlines the **planned price, distribution strategy, and marketing budget** for the first year:

The product will be offered in chocolate, vanilla, and strawberry, in individual packets of six to a box, at a retail price of \$2.49 a box. There will be 48 boxes per case, and

the case price to distributors will be \$24. For the first two months, dealers will be offered one case free for every four cases bought, plus cooperative-advertising allowances. Free samples will be distributed door-to-door. Coupons for 20 cents off will appear in newspapers. The total sales promotional budget will be \$2.9 million. An advertising budget of \$6 million will be split 50:50 between national and local. Two-thirds will go into television and one-third into newspapers. Advertising copy will emphasize the benefit concepts of nutrition and convenience. The advertising-execution concept will revolve around a small boy who drinks instant breakfast and grows strong. During the first year, \$100,000 will be spent on marketing research to buy store audits and consumer-panel information to monitor market reaction and buying rates.

The third part of the marketing-strategy plan describes the **long-run sales and profit** goals and marketing-mix strategy over time:

The company intends to win a 25 percent market share and realize an after-tax return on investment of 12 percent. To achieve this return, product quality will start high and be improved over time through technical research. Price will initially be **set at a high level and lowered gradually** to expand the market and meet competition. The total promotion budget will be boosted each year about 20 percent, with the initial advertising-sales promotion split of 65:35 evolving eventually to 50:50. Marketing research will be reduced to \$60,000 per year after the first year.

Business Analysis

After management develops the product concept and marketing strategy, it can evaluate the proposal's business attractiveness. Management needs to prepare sales, cost, and profit projections to determine whether they satisfy company objectives. If they do, the concept can move to the development stage. As new information comes in, the business analysis will undergo revision and expansion.

ESTIMATING TOTAL SALES Total estimated sales are the **sum of estimated first-time sales, replacement sales, and repeat sales**. Sales-estimation methods depend on whether the product is a one-time purchase (such as an engagement ring or retirement home), an infrequently purchased product, or a frequently purchased product. For one-time purchased products, sales rise at the beginning, peak, and later approach zero as the number of potential buyers is exhausted (see Figure 20.6 [a]). If new buyers keep entering the market, the curve will not go down to zero.

Infrequently purchased products—such as automobiles, toasters, and industrial equipment—exhibit replacement cycles dictated by physical wearing out or by obsolescence associated with changing styles, features, and performance. Sales forecasting for this product category calls for estimating first-time sales and replacement sales separately (see Figure 20.6[b]).

Frequently purchased products, such as consumer and industrial nondurables, have product life-cycle sales resembling Figure 20.6[c]. The number of first-time buyers initially increases and then decreases as fewer buyers are left (assuming a fixed population). Repeat purchases occur soon, providing that the product satisfies some buyers. The sales curve eventually falls to a plateau representing a level of steady repeat-purchase volume; by this time, the product is no longer a new product.

In estimating sales, the manager's first task is to estimate first-time purchases of the new product in each period. To estimate replacement sales, management has to research the product's *survival-age distribution*—that is, the number of units that fail in year one, two, three, and so on. The low end of the distribution indicates when the first replacement sales will take place. The actual timing will be influenced by a variety of factors. Because replacement sales are difficult to estimate before the product is in use, some manufacturers base the decision to launch a new product solely on the estimate of first-time sales.

For a frequently purchased new product, the seller has to estimate repeat sales as well as first-time sales. **A high rate of repeat purchasing means that customers are satisfied**; sales are likely to stay high even after all first-time purchases take place. The seller should note



FIG. 20.6

Product Life-Cycle Sales for Three Types of Products

the percentage of repeat purchases that take place in each repeat-purchase class: those who rebuy once, twice, three times, and so on. Some products and brands are bought a few times and dropped.³³

ESTIMATING COSTS AND PROFITS Costs are estimated by the R&D, manufacturing, marketing, and finance departments. Table 20.3 illustrates a five-year projection of sales, costs, and profits for the instant breakfast drink.

Row 1 shows the projected sales revenue over the five-year period. The company expects to sell \$11,889,000 (approximately 500,000 cases at \$24 per case) in the first year. Behind this sales projection is a set of assumptions about the rate of market growth, the company's market share, and the factory-realized price. *Row 2* shows the cost of goods sold, which hovers around 33 percent of sales revenue. This cost is found by estimating the average cost of labor, ingredients, and packaging per case. *Row 3* shows the expected gross margin, which is the difference between sales revenue and cost of goods sold.

Row 4 shows anticipated development costs of \$3.5 million, including product-development cost, marketing-research costs, and manufacturing-development costs. *Row 5* shows the estimated marketing costs over the five-year period to cover advertising, sales promotion, and marketing research and an amount allocated for sales force coverage and marketing administration. *Row 6* shows the allocated overhead to this new product to cover its share of the cost of executive salaries, heat, light, and so on.

Row 7, the gross contribution, is found by subtracting the preceding three costs from the gross margin. *Row 8*, supplementary contribution, lists any change in income from other company products caused by the introduction of the new product. It has two components. *Dragalong income* is additional income on other company products resulting from adding this product to the line. *Cannibalized income* is the reduced income on other company products resulting from adding this product to the line.³⁴ Table 20.3 assumes no supplementary contributions. *Row 9* shows the net contribution, which in this case is the same as the gross contribution. *Row 10* shows the discounted contribution—that is, the present value of each future contribution discounted at 15 percent per annum. For example, the company will not receive \$4,716,000 until the fifth year. This amount is worth only \$2,346,000 today if the company can earn 15 percent on its money through other investments.³⁵

Finally, *row 11* shows the cumulative discounted cash flow, which is the cumulation of the annual contributions in row 10. Two things are of central interest. The first is the maximum investment exposure, which is the highest loss that the project can create. We see that the

TABLE 20.3 Projected Five-Year Cash-Flow Statement (in thousands of dollars)

	Year 0	Year 1	Year 2	Year 3	Year 4	Year 5
1. Sales revenue	\$ 0	\$11,889	\$15,381	\$19,654	\$28,253	\$32,491
2. Cost of goods sold	0	3,981	5,150	6,581	9,461	10,880
3. Gross margin	0	7,908	10,231	13,073	18,792	21,611
4. Development costs	-3,500	0	0	0	0	0
5. Marketing costs	0	8,000	6,460	8,255	11,866	13,646
6. Allocated overhead	0	1,189	1,538	1,965	2,825	3,249
7. Gross contribution	-3,500	-1,281	2,233	2,853	4,101	4,716
8. Supplementary contribution	0	0	0	0	0	0
9. Net contribution	-3,500	-1,281	2,233	2,853	4,101	4,716
10. Discounted contribution (15%)	-3,500	-1,113	1,691	1,877	2,343	2,346
11. Cumulative discounted cash flow	-3,500	-4,613	-2,922	-1,045	1,298	3,644

company will be in a maximum loss position of \$4,613,000 in year 1. The second is the payback period, which is the time when the company recovers all of its investment, including the built-in return of 15 percent. The payback period here is approximately three and a half years. Management therefore has to decide whether to risk a maximum investment loss of \$4.6 million and a possible payback period of three and a half years.

Companies use other financial measures to evaluate the merit of a new-product proposal. The simplest is breakeven analysis, in which management estimates how many units of the product the company would have to sell to break even with the given price and cost structure. Or the estimate may be in terms of how many years it will take to break even. If management believes sales could easily reach the break-even number, it is likely to move the project into product development.

The most complex method of estimating profit is risk analysis. Here three estimates (optimistic, pessimistic, and most likely) are obtained for each uncertain variable affecting profitability under an assumed marketing environment and marketing strategy for the planning period. The computer simulates possible outcomes and computes a rate-of-return probability distribution showing the range of possible rates of returns and their probabilities.³⁶

*** Managing the Development Process: Development to Commercialization

Up to now, the product has existed only as a word description, a drawing, or a prototype. This next step involves a jump in investment that dwarfs the costs incurred in the earlier stages. At this stage the company will determine whether the product idea can be translated into a technically and commercially feasible product. If it cannot, the accumulated project cost will be lost except for any useful information gained in the process.

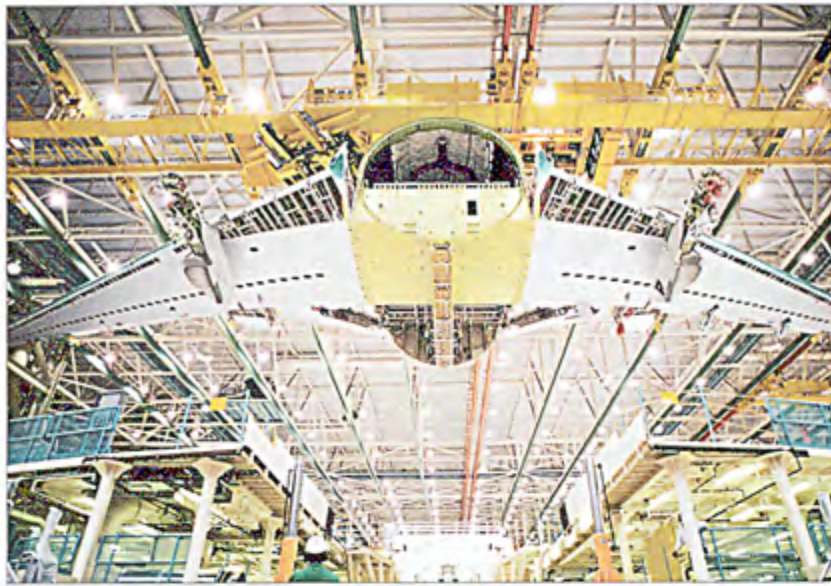
Product Development

The job of translating target customer requirements into a working prototype is helped by a set of methods known as quality function deployment (QFD). The methodology takes the list of desired customer attributes (CAs) generated by market research and turns them into a list of engineering attributes (EAs) that the engineers can use. For example, customers of a proposed truck may want a certain acceleration rate (CA). Engineers can turn this into the required horsepower and other engineering equivalents (EAs). The methodology permits the measuring of the trade-offs and costs of providing the customer requirements. A major contribution of QFD is that it improves communication between marketers, engineers, and the manufacturing people.³⁷

PHYSICAL PROTOTYPES The R&D department will develop one or more physical versions of the product concept. Its goal is to find a prototype that embodies the key attributes described in the product-concept statement, that performs safely under normal use and conditions, and that can be produced within the budgeted manufacturing costs. Developing and manufacturing a successful prototype can take days, weeks, months, or even years. Sophisticated virtual-reality technology is now speeding the process. By designing and testing product designs through simulation, for example, companies achieve the flexibility to respond to new information and to resolve uncertainties by quickly exploring alternatives.

BOEING

Boeing designed its 777 aircraft on a totally digital basis. Engineers, designers, and more than 500 suppliers designed the aircraft on a special computer network without ever making a blueprint on paper. Its partners were connected by an extranet enabling them to communicate, share ideas, and work on the design at a distance. A computer-generated "human" could climb inside the three-dimensional design on-screen to show how difficult maintenance access would be for a live mechanic. Such computer modeling allowed engineers to spot design errors that otherwise would have remained undiscovered until a person began to work on a physical prototype. Avoiding the time and cost associated with building physical prototypes reduced development time and scrap-page and rework by 60 to 90 percent.³⁸



Boeing's 777, designed digitally without a physical prototype, takes its first "flight" across the world's largest building, the Boeing assembly plant in Everett, WA.

With the emergence of the Web, there is a need for more rapid prototyping and more flexible development processes. Michael Schrage, research associate at MIT's media lab, has correctly predicted: "Effective prototyping may be the most valuable 'core competence' an innovative organization can hope to have."³⁹ This has certainly been true for software companies such as Microsoft, Netscape, and the hundreds of Silicon Valley start-ups. Although Schrage says that specification-driven companies require that every "i" be dotted and "t" be crossed before anything can be shown to the next level of management, prototype-driven companies—such as Yahoo!, Microsoft, and Netscape—cherish quick-and-dirty tests and experiments.

Lab scientists must not only design the product's functional characteristics, but also communicate its psychological aspects through physical cues. How will consumers react to different colors, sizes, and weights? In the case of a mouthwash, a yellow color supports an "antiseptic" claim (Listerine), a red color supports a "refreshing" claim

(Lavoris), and a green or blue color supports a "cool" claim (Scope). Marketers need to supply lab people with information on what attributes consumers seek and how consumers judge whether these attributes are present.

CUSTOMER TESTS When the prototypes are ready, they must be put through rigorous functional tests and customer tests. *Alpha testing* is the name given to testing the product within the firm to see how it performs in different applications. After refining the prototype further, the company moves to *beta testing* with customers.⁴⁰ It enlists a set of customers to use the prototype and give feedback. Table 20.4 shows some of the functional tests products go through before they enter the marketplace.

Consumer testing can take several forms, from bringing consumers into a laboratory to giving them samples to use in their homes. In-home placement tests are common with products ranging from ice cream flavors to new appliances. When DuPont developed its new synthetic carpeting, it installed free carpeting in several homes in exchange for the homeowners' willingness to report their likes and dislikes about the product.

Consumer preferences can be measured in several ways. Suppose a consumer is shown three items—A, B, and C, such as three cameras, three insurance plans, or three advertisements.

- **The rank-order** method asks the consumer to rank the three items in order of preference. The consumer might respond with $A > B > C$. Although this method has the advantage of simplicity, it does not reveal how intensely the consumer feels about each item nor whether the consumer likes any item very much. It is also difficult to use this method when there are many objects to be ranked.

- **The paired-comparison** method calls for presenting pairs of items and asking the consumer which one is preferred in each pair. Thus the consumer could be presented with the pairs AB, AC, and BC and say that she prefers A to B, A to C, and B to C. Then we could conclude that $A > B > C$. People find it easy to state their preference between two items, and this method allows the consumer to focus on the two items, noting their differences and similarities.

- **The monadic-rating** method asks the consumer to rate liking of each product on a scale. Suppose a seven-point scale is used, where 1 signifies intense dislike, 4 indiffer-

TABLE 20.4

Examples of Customer Product Tests

Shaw Industries

At Shaw Industries, temps are paid \$5 an hour to pace up and down five long rows of sample carpets for up to 8 hours a day, logging an average of 14 miles each. One regular reads three mysteries a week while pacing and shed 40 pounds in two years. Shaw Industries counts walkers' steps and figures that 20,000 steps equal several years of average wear.

Apple Computer

Apple Computer assumes the worst for its PowerBook customers and submits the computers to a battery of indignities: It drenches the computers in Pepsi and other sodas, smears them with mayonnaise, and bakes them in ovens at temperatures of 140 degrees or more to simulate conditions in a car trunk.

Gillette

At Gillette, 200 volunteers from various departments come to work unshaven each day, troop to the second floor of the company's South Boston manufacturing and research plant, and enter small booths with a sink and mirror. There they take instructions from technicians on the other side of a small window as to which razor, shaving cream, or aftershave to use, and then they fill out questionnaires. "We bleed so you'll get a good shave at home," says one Gillette employee.

Sources: Faye Rice, "Secrets of Product Testing," *Fortune*, November 26, 1994, pp. 172-174; Lawrence Ingrassia, "Taming the Monster: How Big Companies Can Change: Keeping Sharp: Gillette Holds Its Edge by Endlessly Searching for a Better Shave," *Wall Street Journal*, December 10, 1992, p. A1.

ence, and 7 intense like. Suppose the consumer returns the following ratings: $A=6$, $B=5$, $C=3$. We can derive the individual's preference order (i.e., $A>B>C$), and even know the qualitative levels of the person's preference for each and the rough distance between preferences.

Market Testing

After management is satisfied with functional and psychological performance, the product is ready to be dressed up with a brand name and packaging, and put into a market test. The new product is introduced into an authentic setting to learn how large the market is and how consumers and dealers react to handling, using, and repurchasing the product.

Not all companies undertake market testing. A company officer at Revlon, Inc., stated: "In our field—primarily higher-priced cosmetics not geared for mass distribution—it would be unnecessary for us to market test. When we develop a new product, say an improved liquid makeup, we know it's going to sell because we're familiar with the field. And we've got 1,500 demonstrators in department stores to promote it." Many companies, however, believe that market testing can yield valuable information about buyers, dealers, marketing program effectiveness, and market potential. The main issues are: How much market testing should be done, and what kind(s)?

The amount of market testing is influenced by the investment cost and risk on the one hand, and the time pressure and research cost on the other. High investment-high risk products, where the chance of failure is high, must be market tested; the cost of the market tests will be an insignificant percentage of the total project cost. High-risk products—those that create new-product categories (first instant breakfast drink) or have novel features (first gum-strengthening toothpaste)—warrant more market testing than modified products (another toothpaste brand).

The amount of market testing may be severely reduced if the company is under great time pressure because the season is just starting or because competitors are about to launch their brands. The company may therefore prefer the risk of a product failure to the risk of losing distribution or market penetration on a highly successful product.

CONSUMER-GOODS MARKET TESTING In testing consumer products, the company seeks to estimate four variables: *trial*, *first repeat*, *adoption*, and *purchase frequency*. The company hopes to find all these variables at high levels. In some cases, it will find many consumers trying the product but few rebuying it; or it might find high permanent adoption but low purchase frequency (as with gourmet frozen foods).

Here are four major methods of consumer-goods market testing, from the least to the most costly.

Sales-Wave Research In *sales-wave research*, consumers who initially try the product at no cost are reoffered the product, or a competitor's product, at slightly reduced prices. They might be reoffered the product as many as three to five times (sales waves), with the company noting how many customers selected that product again and their reported level of satisfaction. Sales-wave research can also expose consumers to one or more advertising concepts to see the impact of that advertising on repeat purchase.

Sales-wave research can be implemented quickly, conducted with a fair amount of security, and carried out without final packaging and advertising. However, it does not indicate the trial rates that would be achieved with different sales promotion incentives, because the consumers are preselected to try the product; nor does it indicate the brand's power to gain distribution and favorable shelf position.

Simulated Test Marketing Simulated test marketing calls for finding 30 to 40 qualified shoppers and questioning them about brand familiarity and preferences in a specific product category. These people are then invited to a brief screening of both well-known and new commercials or print ads. One ad advertises the new product, but it is not singled out for attention. Consumers receive a small amount of money and are invited into a store where they may buy any items. The company notes how many consumers buy the new brand and competing brands. This provides a measure of the ad's relative effectiveness against competing ads in stimulating trial. Consumers are asked the reasons for their purchases or nonpurchases. Those who did not buy the new brand are given a free sample. Some weeks later, they are reinterviewed by phone to determine product attitudes, usage, satisfaction, and repurchase intention and are offered an opportunity to repurchase any products.

This method gives fairly accurate results on advertising effectiveness and trial rates (and repeat rates if extended) in a much shorter time and at a fraction of the cost of using real test markets. Pretests often take only three months and may cost \$250,000.⁴¹ The results are incorporated into new-product forecasting models to project ultimate sales levels. Marketing research firms report surprisingly accurate predictions of sales levels of products that are subsequently launched in the market.⁴²

Controlled Test Marketing In this method, a research firm manages a panel of stores that will carry new products for a fee. The company with the new product specifies the number of stores and geographic locations it wants to test. The research firm delivers the product to the participating stores and controls shelf position; number of facings, displays, and point-of-purchase promotions; and pricing. Sales results can be measured through electronic scanners at the checkout. The company can also evaluate the impact of local advertising and promotions.

Controlled test marketing allows the company to test the impact of in-store factors and limited advertising on buying behavior. A sample of consumers can be interviewed later to give their impressions of the product. The company does not have to use its own sales force, give trade allowances, or "buy" distribution. However, controlled test marketing provides no information on how to sell the trade on carrying the new product. This technique also exposes the product and its features to competitors' scrutiny.

Test Markets The ultimate way to test a new consumer product is to put it into full-blown test markets. The company chooses a few representative cities, and the sales force tries to sell the trade on carrying the product and giving it good shelf exposure. The company puts on a full advertising and promotion campaign similar to the one it would use in national marketing. Test marketing also permits testing the impact of alternative marketing plans by varying the marketing program in different cities: A full-scale test can cost over \$1 million, depending on the number of test cities, the test duration, and the amount of data the company wants to collect.

Management faces several decisions:

1. **How many test cities?** Most tests use between two and six cities. The greater the maximum possible loss, the greater the number of contending marketing strategies, the greater the regional differences, and the greater the chance of test-market interference by competitors, the greater the number of cities that should be used.
2. **Which cities?** Each company must develop selection criteria such as having good media coverage, cooperative chain stores, and average competitive activity.
3. **Length of test?** Market tests last anywhere from a few months to a year. The longer the average repurchase period, the longer the test period.
4. **What information?** Warehouse shipment data will show gross inventory buying but will not indicate weekly sales at the retail level. Store audits will show retail sales and competitors' market shares but will not reveal buyer characteristics. Consumer panels will indicate which people are buying which brands and their loyalty and switching rates. Buyer surveys will yield in-depth information about consumer attitudes, usage, and satisfaction.
5. **What action to take?** If the test markets show high trial and repurchase rates, the product should be launched nationally; if they show a high trial rate and a low repurchase rate, the product should be redesigned or dropped; if they show a low trial rate and a high repurchase rate, the product is satisfying but more people have to try it. This means increasing advertising and sales promotion. If trial and repurchase rates are both low, the product should be abandoned.

In spite of its benefits, many companies **today skip test marketing and rely on faster** and more economical testing methods. General Mills prefers to launch new products in perhaps 25 percent of the country, an area too large for rivals to disrupt. Managers review retail scanner data, which tell them within days how the product is doing and what corrective fine-tuning to do. Colgate-Palmolive often launches a new product in a set of small "lead countries" and keeps rolling it out if it proves successful.

BUSINESS-GOODS MARKET TESTING Business goods can also benefit from market testing. Expensive industrial goods and new technologies will normally undergo alpha testing (within the company) and beta testing (with outside customers). During beta testing, the vendor's technical people observe how test customers use the product, a practice that often exposes unanticipated problems of safety and servicing and alerts the vendor to customer training and servicing requirements. The vendor can also observe how much value the equipment adds to the customer's operation as a clue to subsequent pricing.

The vendor will ask the test customers to express their purchase intention and other reactions after the test. Vendors must carefully interpret the beta test results because only a small number of test customers are used, they are not randomly drawn, and the tests are somewhat customized to each site. Another risk is that test customers who are unimpressed with the product may leak unfavorable reports about it.

A second common test method for business goods is to introduce the new product at trade shows. The vendor can observe how much interest buyers show in the new product, how they react to various features and terms, and how many express purchase intentions or place orders.

New industrial products can be tested in distributor and dealer display rooms, where they may stand next to the manufacturer's other products and possibly competitors' products. This method yields preference and pricing information in the product's normal selling atmosphere. The disadvantages are that the customers might want to place early orders that cannot be filled, and those customers who come in might not represent the target market.

Industrial manufacturers come close to using full test marketing when they give a limited supply of the product to the sales force to sell in a limited number of areas that receive promotion support and printed catalog sheets.

Commercialization

If the company goes ahead with commercialization, it will face **its largest costs to date**. The company will have to contract for manufacture or build or rent a full-scale manufacturing facility. Plant size will be a critical decision. When Quaker Oats launched its 100 Percent Natural breakfast cereal, it built a smaller plant than called for by the sales forecast. The

demand so exceeded the forecast that for about a year it could not supply enough product to stores. Although Quaker Oats was gratified with the response, the low forecast cost it a considerable amount of profit.

Another major cost is marketing. To introduce a major new consumer packaged good into the national market, the company may have to spend from \$25 million to as much as \$100 million in advertising, promotion, and other communications in the first year. In the introduction of new food products, marketing expenditures typically represent 57 percent of sales during the first year. Most new-product campaigns rely on a sequenced mix of market communication tools.

WHEN (TIMING) In commercializing a new product, market-entry timing is critical. Suppose a company has almost completed the development work on its new product and learns that a competitor is nearing the end of its development work. The company faces three choices:

1. **First entry** – The first firm entering a market usually enjoys the “first mover advantages” of locking up key distributors and customers and gaining leadership. But if the product is rushed to market before it is thoroughly debugged, the first entry can backfire.
2. **Parallel entry** – The firm might time its entry to coincide with the competitor’s entry. The market may pay more attention when two companies are advertising the new product.
3. **Late entry** – The firm might delay its launch until after the competitor has entered. The competitor will have borne the cost of educating the market, and its product may reveal faults the late entrant can avoid. The late entrant can also learn the size of the market.

The timing decision involves additional considerations. If a new product replaces an older product, the company might delay the introduction until the old product’s stock is drawn down. If the product is seasonal, it might be delayed until the right season arrives;⁴³ often a product waits for a “killer application” to occur. Complicating new-product launches, many companies are encountering competitive “design-arounds”—rivals are imitating inventions but making their own versions just different enough to avoid patent infringement and the need to pay royalties.

RADIORAY

Nebraska rancher Gerald Gohl’s innovation was to create a remote-controlled spotlight so he wouldn’t have to roll down the window of his pickup truck and stick out a handheld beacon to search for cattle on frigid nights. By 1997, he held a patent on the RadioRay, a wireless version of his spotlight that was mounted on suction cups or brackets and could rotate 360 degrees. Selling for \$200, RadioRay attracted attention from ranchers, boaters, hunters, and police—even Wal-Mart’s Sam’s Club chain. Gohl rejected the retailers’ overtures, however, fearing that it might seek lower prices that would anger his distributors. Shortly thereafter, Sam’s Club began to sell its own wireless, remote-controlled spotlight that was nearly identical to the RadioRay except for a small plastic part restricting the light’s rotation to slightly less than 360 degrees and its price—\$60. Gohl successfully sued for patent infringement in 2000, but still could face an appeal.⁴⁴

WHERE (GEOGRAPHIC STRATEGY) The company must decide whether to launch the new product in a single locality, a region, several regions, the national market, or the international market. Most will develop a planned market rollout over time. Coca-Cola launched its new soda, Citra, a caffeine-free, grapefruit-flavored drink, in about half the United States. The multistaged rollout, following test marketing in Phoenix, southern Texas, and southern Florida, began in January 1998 in Dallas, Denver, and Cincinnati.⁴⁵

Company size is an important factor here. Small companies will select an attractive city and put on a blitz campaign. They will enter other cities one at a time. Large companies will introduce their product into a whole region and then move to the next region. Companies with national distribution networks, such as auto companies, will launch their new models in the national market.

Most companies design new products to sell primarily in the domestic market. If the product does well, the company considers exporting to neighboring countries or the world



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A Web ad from the Phillips Pronto site for the TSU7000 model Pronto Pro.

market, redesigning if necessary. Cooper and Kleinschmidt, in their study of industrial products, found that domestic products designed solely for the domestic market tend to show a high failure rate, low market share, and low growth. In contrast, products designed for the world market—or at least to include neighboring countries—achieve significantly more profits, both at home and abroad. Yet only 17 percent of the products in Cooper and Kleinschmidt's study were designed with an international orientation.⁴⁶ The implication is that companies should adopt an international focus in designing and developing new products.

In choosing rollout markets, the major criteria are market potential, the company's local reputation, the cost of filling the pipeline, the cost of communication media, the influence of the area on other areas, and competitive penetration. The presence of strong competitors will influence rollout strategy. Suppose McDonald's wants to launch a new chain of fast-food pizza parlors. Pizza Hut, a formidable competitor, is strongly entrenched on the East Coast. Another pizza chain is entrenched on the West Coast but is weak. The Midwest is the battleground between two other chains. The South is open, but Shakey's is planning to move in. McDonald's faces a complex decision in choosing a geographic rollout strategy.

With the Web connecting far-flung parts of the globe, competition is more likely to cross national borders. Companies are increasingly rolling out new products simultaneously across the globe, rather than nationally or even regionally. However, masterminding a global launch poses challenges.

Companies will increasingly add the Web as another advertising medium to launch and describe each important new product:

PHILIPS

Philips, the Dutch electronics company, recently launched Pronto, an "Intelligent Remote Control" to replace all other devices that receive infrared signals. Its Web address, www.pronto.philips.com, contains several features: About Pronto, A Virtual Tour, Where to Buy, Pronto News, Pronto Communities, and FAQs and Contacts. This is much richer information than any ad could offer.

TO WHOM (TARGET-MARKET PROSPECTS) Within the rollout markets, the company must target its initial distribution and promotion to the best prospect groups. Presumably, the company has already profiled the prime prospects, who would ideally have the following characteristics: They would be early adopters, heavy users, and opinion leaders, and they could be reached at a low cost.⁴⁷ Few groups have all these characteristics. The company should rate the various prospect groups on these characteristics and target the best group. The aim is to generate strong sales as soon as possible to attract further prospects.

HOW (INTRODUCTORY MARKET STRATEGY) The company must develop an action plan for introducing the new product into the rollout markets. In 1998, Apple Computer staged a massive marketing blitz to launch the iMac, its reentry into the computer PC business after a hiatus of 14 years. Five years later, Apple struck gold again with the launch of the iPod.

APPLE IPOD

As with virtually all its products, Apple's design for its iPod MP3 player is striking. Sleek and cool, the product also offers much functionality. Apple paired iPod with the legitimate download song service iTunes through catchy TV commercials featuring black silhouettes of people listening to music with N.E.R.D.'s remix of "Rock Star" in the background. To target Gen Y, Apple created the Web site, www.ipodrocks.com, in November 2003. It touts the iPod as a gift for the holidays and offers suggestions to convince parents to buy one ("Ask nicely," "Stake your grades on it," "Do a good deed," and "Subliminal advertising"). Apple also initiated marketing collaborations with corporate icons America Online and Volkswagen. Apple sold more than 2 million iPods and its iTunes support in less than a year and captured more than 50 percent of the new market. It then broadened the market further by pushing the iPod mini—a 3.6-ounce player capable of holding 1,000 CD-quality songs.⁴⁸

To coordinate the many activities involved in launching a new product, management can use network-planning techniques such as critical path scheduling. **Critical path scheduling (CPS)** calls for developing a master chart showing the simultaneous and sequential activities that must take place to launch the product. By estimating how much time each activity takes, the planners estimate completion time for the entire project. Any delay in any activity on the critical path will cause the project to be delayed. If the launch must be completed earlier, the planner searches for ways to reduce time along the critical path.⁴⁹

*** The Consumer-Adoption Process

Adoption is an individual's decision to become a regular user of a product. How do potential customers learn about new products, try them, and adopt or reject them? The *consumer-adoption process* is later followed by the *consumer-loyalty process*, which is the concern of the established producer. Years ago, new-product marketers used a *mass-market approach* to launch products. This approach had two main drawbacks: It called for heavy marketing expenditures, and it involved many wasted exposures. These drawbacks led to a second approach, *heavy-user target marketing*. This approach makes sense, provided that heavy users are identifiable and are early adopters. However, even within the heavy-user group, many heavy users are loyal to existing brands. New-product marketers now aim at consumers who are early adopters.