

The Dual-Drive Concept of Product Innovation

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Neither technology nor markets can drive product innovation by themselves. They need each other for optimum performance.

meal. Edwin Land gave us the Polaroid Camera and Polavision.

This view is simplistic, and in yesterday's world it worked pretty well. But research shows that top players know the push-pull approach is wrong today. These people want push and pull—a market drive and a technology drive—at the same time. For example, pharmaceutical firms are said to be technology driven; but their research centers are staffed with MDs (customers), and they have the world's best set of market data on disease incidence and needs. In the same vein, "consumer-driven" Procter & Gamble (P&G) pairs its consumer knowledge with two levels of advanced technology research, and only rarely will they market a product that is not technically superior. In fact, Pringles potato chips was a failure of technology drive, and in P&G yet!

The new approach can best be called dual drive, to contrast it with the two single drives of technology and market. In the dual-drive approach, every new product project, before it gets under way, has the dual direction of a specific market (user problem) and a specific technology that will be used to find the solution to that problem. Whatever the project comes up with, chances are it will sell, because there was a known need and a technical capability to match.

Traditional wisdom on new products says that a firm should be either market driven or technology driven—that is, give the market either what it wants or what technologists believe it will want. Quaker gave us cinnamon-flavored instant oat-

meal. Such products are quality, and sell at high value added.

This article spells out the nature of the dual strategy in contrast to the old, and describes the very unique set of actions necessary to implement it profitably. Incidentally, the term "product" includes both goods and services; service firms often become technology driven because of their fixed base of service facilities.

THE HISTORICAL VIEW

The traditional one-drive strategy has been expressed in many ways. Here are some examples:

The planning approach will be very different depending on whether the company's business is based on "technology-push" or "demand-pull," and whether planning is controlled by the R&D or the marketing function.

Some innovations arise in response to a documented need or demand. They are often referred to as "needs-generated" or "technology-pull" innovations. This is in contrast to "means-generated" or "technology-push" innovations, which arise from a technical capability.

Ideas may be generated by the marketplace. . . . [S]uch market-pull ideas represent the majority of new product projects. But technology-push ideas—which are generated by research or a serendipitous discovery—also play an important role.

The first of these authors went on to say, "It must be possible for innovations to find their way from the R&D department into the wider organi-

zation where they can be 'commercialized.' . . . To create an environment in which this 'commercialization' can take place, managers must provide a clear division of responsibility between R&D and other company functions." The new thinking says this "clear division" is just what we have too much of already.

Years ago there were fewer owners of key technologies, less competition in the marketplace, more time, and less need to optimize the firm's resources. But today managements complain about a raft of problems that hobble too many of their new product programs. Here are the leading ones:

1. Friction. Too many people spend too much time fighting with each other, squabbling over turf, missing signals, trying to adjust invisible pecking orders. Strategically opting for either technology or marketing is like deciding which member of an outstanding double-play combination deserves a bonus.

2. Lost time. New product programs seem to be "a day late and a dollar short," with frequent postponements and no real commitment by the people involved.

3. Unnecessarily high costs. Much of the new product process is inefficient, with projects that abort, monies drained away to "more urgent" needs, and repeated starts, stops, and stuttering.

4. Excessive involvement of top management. Some executives feel it's almost impossible to delegate new product projects. They have to settle arguments, make the critical decisions, aid in the communicating, and actually do much of the work others should do.

5. Poor products. Too many fail or just never sell very well. Too many are mediocre at best, with little real differentiation, little value added, and little salability.

THE NEW VIEW

One big reason for problems like these is that the people working on new product projects do not work together. They are separated by the initial strategic decision to make one of two players the important one. If the firm uses market drive, technology people wait and respond, and vice versa.

But what happens if the firm uses dual drive? The two key functions are merged and synergized. There is still drive, because the project needs leadership and purpose, but the participants become one rather than many. The functions are not just joined or connected; that's the way it was. Dual drive means one drive forged from the skills of two perspectives. New products shall exploit one or more of the firm's strong technologies and make a major contribution to solving specific customer problems.

We shouldn't call these teams "balanced," although the term has been used in this connection. Balance implies equality and scales. Look at the legs of a chair—one may do more work than another, or be harder to build, or cost more or take longer, but it still takes four legs to make a good chair.

I've heard managers say, "We're using technology and market in a 70/30 ratio." Guess who has to call whom? Can the problem be less important than the solution, or vice versa?

Examples

Here are some examples, selected from different product situations.

A consumer packaged good. Consumers like puddings and gelatins, but they want interesting new "snacks." General Foods knew frozen technology and puddings. Put the two together and you have Jell-O Pudding Pops (and lots more).

More complex consumer packaged goods situation. S.C. Johnson found that people were increasingly concerned about skin care problems. The company also knew they had a strong monomer and polymer film-forming technology. They added to it by acquiring a dermatology lab and put the dual focus to work to come up with \$22 million Soft Sense as a starter.

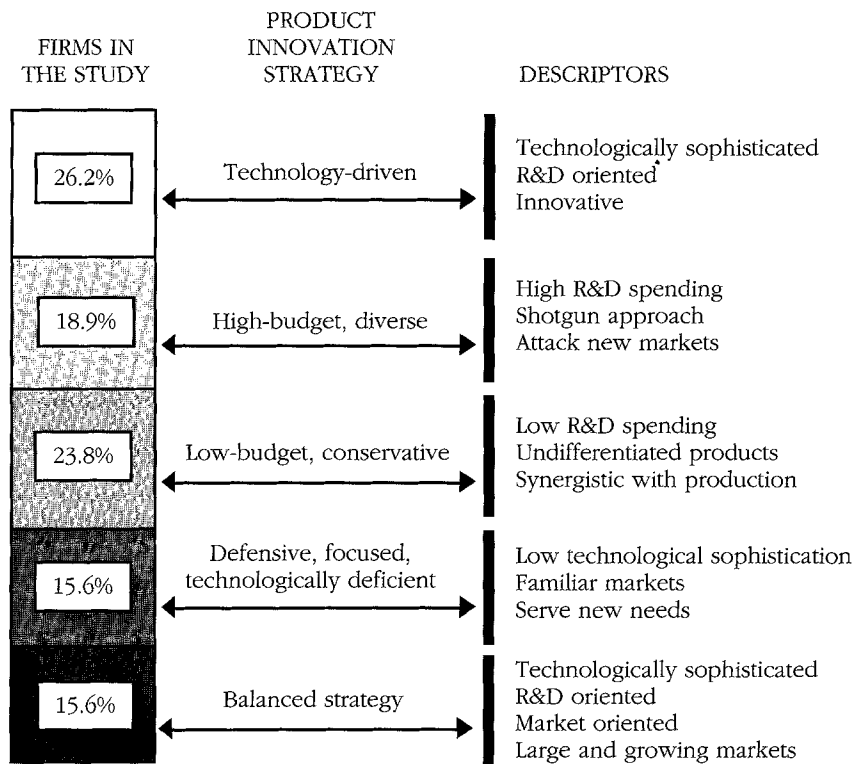
Technical consumer durable. The Kodak Disc Camera came from a project that specifically combined the firm's disc technology with the consumers' problem of taking pictures when they were uncertain whether there was enough light. As CEO Walter Fallon said, "New products must meet the test of the laboratory and the marketplace" ("Fallon . . ." 1983)

Standardized industrial products. Standard Products Co., a very profitable \$433 million firm in Cleveland, succeeds by doing two things: concentrating only on making door and window seals for the Big Three automakers (whose problems they have grown to know very well) and refusing to make "anything that wasn't made by sandwiching layers of metal, rubber, and vinyl" (Reid 1987).

Specialty industrial, low-tech. Signode assigned a specially appointed team to come up with new products that (1) exploited the firm's plastic extrusion technology and (2) met the needs of the burgeoning manufactured foods market. Plastic trays for food producers to use in making microwaveable foods was their first new product, and the approach has now been extended to other teams.

Technical industrial. As an example of what almost was, one maker of optical scanning equipment felt the business world needed a product for transferring a typed page to the com-

Figure 1
Product Innovation Strategies in Relation to Performance of the Firm



Source: Robert G. Cooper, "New Product Strategies: What Distinguishes the Top Performers," *Journal of Product Innovation Management*, June 1984, pp. 151-164.

puter. They combined that "need" with their optical scanning technology and came up with some new products. Unfortunately, they didn't find out what the real need was: business firms wanted lower-cost ways of original computer entry—ways to eliminate the typed page, not optically scan it.

Packaging. Cold cream, soup, fruit drinks, and toothpaste are just a few of the products where consumer disinterest in what they felt were old-fashioned products was combined with new packaging technologies to produce what the market accepted immediately.

Contrasts with Related Concepts

There is no shortage of concepts in management literature today, so dual drive must be distinguished from several that may resemble it. First is the familiar product/market matrix or technology/applications matrix, commonly used in strategic market planning. These actually are descriptive

devices, helping to display options. One can stay in any particular product/market box or enter any particular box. If a technology or product is not currently owned, it can be developed, rented, or bought. Strategically, the firm can use technology drive, market drive, or dual drive in any of the four boxes.

A second related concept is the offensive/defensive typology. This usually means whether one wants to lead (be first) or follow. And although many authors associate offensive with R&D, all three drives can be used with any dimension of leadership. One can be first using market drive; one can be late using technology drive.

Empirical Evidence

To my knowledge, the only empirical study that compares the payoff from differing new product strategies was done in Canada, and only with industrial firms. Other studies may be under way, but their findings are not available. In the meantime, **Figures 1** and **2** show the Canadian findings. The study sorted respondent firms into five strategy categories, based partly on focus, partly on aggressiveness, and partly on innovativeness. I have further grouped them by drive.

The results are quite clear—firms that were deliberately committed to both a market/need focus and to R&D won. In time we will see whether these findings hold up in other countries and other product categories.

How Dual Drive Helps Solve the Problems

As a recap, let's go back to the five big problems managements cite today and see how the new strategy helps solve them.

Friction. In single drive there is often little incentive to work with the other functions, since the leader tells others what is going to be done. I know that marketers sometimes hope technology-driven projects fail, just so the arbitrary technocrats will be knocked down a notch. I am told that the feelings in R&D are often about the same on market-driven projects. Friction is probably based most often on the very thing dual drive assures will not happen—two sets of opinions on what the market needs.

Slowness. Slowness is probably caused most by the friction just discussed. Second, it comes when developers go beyond customer needs and

add unnecessary product attributes (over-engineer). Third, dual drive softens the impact when a key player leaves; single-drive projects are often dependent on one person rather than a team. And fourth, dual drive helps avoid orphan projects, which are the slowest to move along.

High costs. All of the above factors cause costs to rise. Also, better communication is increasingly seen as a cost-cutter.

Excessive involvement of upper managements. Perhaps the most direct benefit of dual drive is that it permits delegation based on agreement. All too often senior managements must budget on faith—faith in a person or in a technology. Dual drive hedges that bet by involving a team of people and at least two key players. The plan now has a proven need and an applicable technology. This gives the team strength to do what some say is their toughest task: handle the changing priorities of management. On dual drive, the entire team resists arbitrary change, but on single drive there is usually only one resister, and other team members privately back management—even feeding information and assistance to them.

Poor products. Dual drive avoids the worst outcome—when buyers don't want or need the product technologists thought they should. It avoids trivial innovation, me-too products, and products with no value added. It resists the compromises to insignificance. And defective products are detected during development, because dual drive requires that new products be field tested with the customers whose problem the company started with.

IMPLEMENTATION

Many managements can buy the concept of dual drive quickly. They know that new products are “a mating of technology and markets.” But to implement dual drive is much tougher than they anticipate. Based on the experience of many firms, it is a totally new way of thinking about new products and requires acceptance of several more key concepts. Here is

Figure 2
Relative Success of Different Product Innovation Strategies

THREE TYPES OF “DRIVEN” STRATEGIES	SUCCESS OF THE STRATEGIES
1. Technology-Driven (Includes “Technology-driven” and “High-budget, diverse” from Figure 1)	Moderate to poor performance. Low success, low profitability, ranking near the bottom.
2. Market-Driven (Includes “Low-budget, conservative” and “Defensive, focused, technologically deficient” from Figure 1)	Low budget was satisfactory in performance, but with little effect on sales and profits. Defensive was poor performance, and deficient on most measures.
3. Dual-Drive (Includes “Balanced strategy” from Figure 1)	Fared the best. First on nearly every performance measure.

HOW SUCCESS WAS MEASURED

1. Meeting new product program performance objectives
2. Generating sales and profits
3. Success of the program versus competitors
4. Overall success of the program

Source: Robert G. Cooper, “New Product Strategies: What Distinguishes the Top Performers,” *Journal of Product Innovation Management*, June 1984, pp. 151-164.

a selection of the really difficult concepts, in the general sequence of action but not a complete step-by-step process.

1. Dual drive requires identifying an important, unmet customer need (present or certain future) before undertaking extensive R&D. This costs money and may seem to slow down the real start of the project. Booz Allen & Hamilton research (1982) shows that more than 20 percent of the cost of new product development is now spent prior to the start of R&D.

2. Dual drive requires a thorough study of the identified need—who has it, do they know they have it, what have they done about it, and what are competitors doing? Even market-driven situations often take these matters for granted, and technology-driven projects almost always do. The Association of National Advertisers recently asked new products people what they would most like additional money for. At the top of their list was money for more study of market situations before technical work is begun (Hoo and McDonald 1983). Too often we hear a technical person state unequivocally the preference of customers. Marketers do the same thing, sometimes with a better base of information and sometimes not.

3. Dual drive requires that, before R&D, at least one specific technology be identified that logically could hold the answer to some or all of the customer needs. In contrast, market-driven programs simply go to technologists and say "do this."

4. If the firm lacks that technology, dual drive demands that it be acquired. Too often R&D is motivated to depend on a weaker technology and avoid calling for acquisition of the best one. Wise managements avert this by having technol-

ogy audits (sometimes called technology assessments) done early on. These audits use a broad definition of technology, meaning the power to do work or the power to solve problems. This definition includes machines, processes, systems, and networks; it also includes particular persons' minds, specific sciences, patterns, and recipes. And it includes manufacturing pro-

cesses and capabilities, distribution systems, and even management processes (such as the product management systems in consumer packaged goods firms).

Occasionally a key technology may lie in a physical entity (the 386 chip or MS-DOS), but technology is broader than that. If a firm is in the business of doing basic research to develop new technologies (say, Dow with Saran Wrap), these outputs in turn may become source or implementable technologies for new product teams who create what is eventually sold as a product. Or, the technology may itself be licensed or sold.

5. Dual drive requires that resilience be built in. This means anticipating future changes in the market need and in the selected technology, and being sure of a place to move to if changes block the new program during development. A dual drive program rarely aborts or waffles, because the system is based on key strengths in the organization.

6. Dual drive requires forming a team of all functions that will be of major importance in the project. How often over recent years have we been told that manufacturing people should be involved from the beginning? But they often are not, as firms say they cannot afford the costs of teams or they lack the people to staff teams. It takes at least two people (R&D and marketing) to

have dual drive, and those two usually demand a full team.

7. Dual drive requires that team members get a clear assignment with objectives for that team. They should know their customer need/technology mandate, of course, but they should also know their objectives. Are they to produce anything other than profits, such as sales, market share, viable position in a new market, thwarting of competitive positions, or enhancement of image? It is surprising how often team problems stem from differing guesses about team objectives.

8. Dual drive means there must be a plan that spreads out big dollar commitments consistent with the developing information pool. We should spend wisely. It is not just government bureaucrats who spend authorized money as soon as they can; functions tend to as well, if the spenders are free to do so without other functions' concurrence.

9. Dual drive requires that project priority decisions be made at the general management level. These priorities are then used to guide all functional groups working on new product projects. At present, many R&D departments and marketing departments prepare their own project priorities without enough help from the other functions. How sad it is to see a technical group planning a market survey to estimate future market needs as input to their internal priority setting.

Most R&D units like to portfolio their budgets to keep some money available for basic (wildcatting) work. Du Pont, for example, allocates 17 percent of their billion-dollar budget for that purpose. Such funds are true technology-driven situations and support maverick technologies and maverick people. But they are high-risk projects, outside dual drive.

10. Management should make sure there is indeed dual drive. There may be form without substance; setting up teams does not generate teamwork. They need supportive functional management heads in the departments and an honest desire to make their functions subservient to the twin drives in the project assignment.

11. Dual drive requires that team leaders be transformational managers, fully able to grasp the nature and style of general management, motivated to the longer-term payoff of project success, and able to fight off arrows in the back. Most firms don't have enough of these people to staff truly general management positions, let alone a group of new product teams. Fortunately, many dedicated functional managers remain functional in their perspective, but manage to deal constructively with dual drive. After all, under single drive it was win-lose—now it's win-win.

"Dual drive requires that team leaders be transformational managers, fully able to grasp the nature and style of general management, motivated to the longer-term payoff of project success, and able to fight off arrows in the back."

EXCEPTIONS/CRITICISMS

Every good strategy has its exceptions. Some firms don't really want innovative products—they take their cues from competition. Or they commit totally to operations—solid quality at the lowest cost. Executives from these firms skipped this article.

But other firms say they don't want dual drive; they say they are technology committed and base their new products entirely on technical innovation. But the most successful ones (Merck, Herman Miller, Intel, among others) are not really one-sided at all. Merck's scientists know full well what the medical problems of the physician are. Herman Miller's furniture designers work well apart from marketing and are actually encouraged not to ask for market research reports. But in fact they are very close to the world's business office, personally. Herman Miller's famous Action Office designer, Bob Propst, lived in Ann Arbor, Michigan, more than 100 miles from the firm's marketers. But he literally immersed himself in the problems of the office. Dual drive calls for a customer problem, not necessarily that the problem originate in the marketing department.

Du Pont represents another technology-driven firm. But it is usually not oblivious to the needs of its customers either; it knew that the carpet industry badly needed something to give added resistance to stains. Stainmaster was not a technology shot in the dark. But Kevlar may have been, and the firm has spent years looking for problems that needed the Kevlar solution. And Du Pont was surprised to learn that most golfers didn't want plastic golf shoes. Edwin Land had no doubts that people wanted to see their still photographs quickly, but he couldn't find a problem for Polavision to solve.

Goodyear didn't need vehicle makers' assurance that synthetic rubber tires would be useful. Salk didn't need a sales manager to tell him that doctors would like a polio vaccine if he found one. Consumers opted against play-only TV devices in favor of play-and-record ones.

Most worthwhile scientific discoveries have been based on well-understood market needs, whereas most scientific bombs have not. Unfortunately, it is sometimes considered blasphemous for a scientist to advocate dual drive.

Owens-Corning had a revealing experience in the mid-1980s. It took a technology-driven approach to the problem of cracked highways. The approach failed totally. A second attempt, with a new team, involved highway people from the very beginning, and succeeded instantly.

This article has focused on a growing practice in the management of product innovation—that of discarding technology

drive and market drive in favor of drive by both, or dual drive. Every new product project is focused on a clear and confirmed customer problem and on a specific technology (in R&D, in operations, or wherever) that management thinks holds the answer to that problem. Neither of the two forces drives anything alone. Together they can drive powerful, profitable solutions. □

References

- H. Igor Ansoff and John M. Stewart, "Strategies for a Technology-Based Business," *Harvard Business Review*, November-December 1967, pp. 71-83.
- Roger A. Bengston, "Nine New Product Strategies: Each Requires Different Resources, Talent, Research Methods," *Marketing News*, March 19, 1982, p. 7.
- Noel Capon and Rashi Galzer, *Marketing Technology: A Strategic Co-Alignment* (Cambridge, Mass.: Marketing Science Institute, 1986).
- Robert G. Cooper, *Winning At New Products* (Don Mills, Ontario, Canada: Addison Wesley, 1986).
- "Fallon of Eastman Kodak Receives Gantt Medal," *AMA Forum*, May 1983, pp. 33-34.
- Christopher Freeman, *The Economics of Industrial Innovation* (Harmondsworth, England: Penguin Books, 1974).
- Laurie Freeman, "S.C. Johnson Shines with New Products," *Advertising Age*, June 10, 1985, p. 4.
- David W. Gibson, "A Maze for Management: Choosing the Right Technology," *Chemical Week*, May 8, 1986, pp. 74-78.
- Kathryn Rudie Harrigan, "Guerrilla Strategies for Underdog Competitors," *Planning Review*, November 1986, pp. 4-11.
- David Hoo and Robert McDonald, "A Prescription for Success," a speech given to the Association of National Advertisers New Product Marketing Workshop, New York, NY, November 2, 1983.
- Jonathan Joseph, "Don't Stick to Your Knitting," *International Management*, March 1986, pp. 20-24.
- Jeremy Main, "General Foods Goes Back to Growing," *Fortune*, January 1983, pp. 92-95.
- John P. McKelvey, "Science and Technology: The Driven and the Driver," *Technology Review*, January 1985, pp. 38-47.
- Russell Mitchell, "The Health Craze Has Kellogg Feeling G-r-r-eat," *Business Week*, March 30, 1987, pp. 52-53.
- New Products Management for the 1980s* (Chicago: Booz Allen & Hamilton Inc., 1982).

Harry Nystrom, *Creativity and Innovation* (Chichester, England: John Wiley & Sons, 1979).

Harry Nystrom, "Product Development Strategy: An Integration of Technology and Marketing," *Journal of Product Innovation Management*, June 1985, pp. 25-33.

Giorgio Petroni, "Who Should Plan Technological Innovation," *Long Range Planning*, October 1985, p. 108.

James Reid, "A Hero in the Rust Belt," *Fortune*, January 5, 1987, p. 103.

"Repackaged Products Find New Markets," *Marketing News*, February 13, 1987, p. 6.

Robert J. Schaffhauser, "How a Mature Firm Fosters Intrapreneurs," *Planning Review*, March 1986, pp. 6-11.

William E. Souder, *Managing New Product Innovations* (Lexington, Mass.: Lexington Books, 1986).

B.J. Spalding, "How Du Pont Spends Its \$1.1 Billion Budget," *Chemical Week*, July 31, 1985, pp. 20-23.

William J. Spencer and Deborah H. Triant, "Strengthening the Link Between R&D and Corporate Strategy," *The Journal of Business Strategy*, January-February 1989, pp. 38-42.

Alex Taylor, "Why the Bounce at Rubbermaid?" *Fortune*, April 13, 1987, pp. 77-78.

"Team Strategy: P&G Makes Changes in the Way It Develops and Sells Its Products," *Wall Street Journal*, August 11, 1987, p. 1.

William D. Zarecor, "High-Technology Product Planning," *Harvard Business Review*, January-February 1975, pp. 108-115.

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