

How to Design the Perfect Product

Start with Craig Vogel and Jonathan Cagan. Integrate style and technology with a dash of fantasy. Apply to everything from toasters to cars.

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A visit to Craig Vogel's cluttered office at Carnegie Mellon University is a journey to the intersection of creative destruction and American consumerism. His shelves are a graveyard; a loving anthology; and a shrine to the good, the great, and the truly idiotic. Here's that indestructible metal toaster you used when you were a kid. A few black rotary telephones -- the kind that Ma Bell used to make. There are radios, coffeemakers, blenders. And there are potato peelers -- lots of potato peelers. More on those later.

Vogel is a professor of design. With Jonathan Cagan, a mechanical-engineering professor at the university, he teaches a course in product development. The two academics research and consult on the subject of new product design for such companies as Ford Motor, Motorola, and Whirlpool. This is what they've learned so far: Companies don't do a very good job of developing new products.

The issue: Engineers are from Mars, designers are from Venus. Engineers tend to obsess over the details of getting products to work -- but they're uncomfortable with the critical questions that have to be answered before a new product ever gets to manufacturing. Who will buy it? What value will it add? Designers revel in those sloppier issues, but they tend to cower when confronted with problems related to craftsmanship, durability, and reliability. That results in product after product that fails on one dimension or the other -- or worse yet, both.

In their book, *Creating Breakthrough Products: Innovation from Product Planning to Program Approval* (Prentice Hall, 2002), Vogel and Cagan advocate an integrated approach to product design. Innovative new products, the authors argue, come from mastering the "fuzzy front end." They happen when a company delivers on both style and technology in a way that can provide some measure of fantasy.

Surrounded by Coke cans from eras past, toasters, and the occasional potato peeler, Vogel and Cagan spoke with Fast Company about inventing and delivering successful new products.

Managing the Fuzzy Front End

Design problem: Merge style with technology. The 1935 Sears Coldspot, developed with designer Raymond Loewy, was a bold leap forward for the lowly refrigerator. Loewy gave the clunky cold box a clean new look, wrapping the cooling unit with sheet metal. He made it easy for owners to open the door, even when their arms were filled with groceries. And he replaced the metal shelves inside with aluminum to prevent rusting. This was an early example of the integration of style and technology -- and sales soared.

Cagan: The "fuzzy front end" is a term we heard used a lot in the industry. It's a very early stage of product development, when you're really not sure what you're designing yet. You're trying to figure out what your opportunity is -- and to assess the whole context for that opportunity.

Vogel: Many people, especially engineers, are uncomfortable with the fuzzy front end. They see getting through it as something you do on the way to a place where you can measure things more effectively. But our message is, You absolutely have to treat that part of the process well. The Coldspot was a very early example of what happens when a company spends enough time on the

front end -- and the result was effective. Sears and Loewy answered the question, How do you bring this monster machine from the back porch into the kitchen? They saw the opportunity.

Cagan: A lot of companies just worry about getting the product out. They figure, Let's not worry about this early stuff. We'll focus on manufacturing, and we'll get it to work at the end. So they either create beautifully made products that no one wants, or they miss all of their deadlines because they're trying to catch up at the end. We found that by investing time in the fuzzy front end, you can accelerate the development process.

Form and Function Fulfill ... Fantasy!

Design problem: Make an impersonal machine into a personal tool. The Wave, from Crown Equipment Corp., isn't your father's forklift. After reviewing industry trends and witnessing the difficulties that warehouse employees had when using rolling ladders to get parts, Crown developed an entirely different product. The Wave extended Crown's core technical capabilities with less scale and weight. It was safer, quicker, and easier to control.

Vogel: The traditional definition of value has been to produce the most number of units for the lowest price while getting them into the hands of the most people. But what people value and the way that they interact with a product goes beyond price. The visual form, the way that they handle it, and how it makes them feel are all part of the value statement.

Cagan: We have tried to create a way for companies to understand their target markets by identifying value opportunities. By really thinking about where the market is at and where you want to go, you can understand the opportunities -- and then you create product goals. That's how you help define product.

Vogel: We've gone from the concept of mass value, where you can have a huge, well-defined market, to a world where value is subdivided and defined in more discrete ways. People still have shared values at one level. But they also bring very discrete values that they want from a product. So a consumer who wants a Subaru Outback is much different from one who wants a Mercedes SUV -- even though they both want an all-weather, four-wheel-drive vehicle.

Cagan: Value is all about fulfilling fantasy. For engineers, their driving statement traditionally has been the concept that form follows function. For designers, it's usually the opposite. But you need both. Your goal is to create a great experience -- the fantasy -- for the customer.

Fantasy doesn't have to be exotic. You could be working in a warehouse in a parts-pick job. You're running around in sneakers on a rolling ladder and you're mad at the world and it's a terrible job. Wouldn't it be great if you had more control and more power? The Crown Wave is a great example of fulfilling that fantasy. It's small and fun to use. It empowers people. Although it's more expensive than a rolling ladder, workers become more efficient, and they stay in their jobs longer because they're happier.

Scaling the "Sheer Cliff of Value"

Design problem: Find the beauty in a potato peeler. Sam Farber, already a successful entrepreneur, sensed an opportunity in the housewares industry after watching his wife, an arthritis sufferer, struggle with existing kitchen tools. Farber's insight introduced utensils that weren't just comfortable to use, but that also set a new aesthetic standard.

Vogel: Here's a generic potato peeler, the same one people have used for a century. You have sheet metal wrapped around a form to give it a basic shape, with a center line running through it that both locks the handle together and integrates the blade into the handle. This is about the cheapest way to deliver on a form that has both a blade and a handle. It's dictated more by manufacturing than by the function of its use.

Now look at Farber's version, OXO's Good Grips Swivel Peeler. There's a broad Santoprene handle

that makes it easy to grip. The flexible fins make the handle appear lighter and add comfort. And the curved blade shield echoes the shape of the handle. This potato peeler was built from the customer backward rather than from the manufacturer forward. Part of the fantasy here is, I have arthritis and I can't use a standard peeler, but I have an alternative with OXO's version.

Cagan: It also elevates potato peeling to an aesthetic statement of who we are. Now everyone can own a contemporary product that looks beautiful and has a sort of richness. It takes a mundane task and makes it more enjoyable. You can even hang it up. The upshot is, there's value in that fantasy. The OXO potato peeler costs about \$7, which is five times the price of the generic version, but it doesn't cost that much more to make.

Vogel: We think of product design in terms of a two-by-two matrix: One axis is style, and the other is technology. The generic potato peeler falls into the lower left of the map. It's functional, but it has very little style or defining technology. Great, value-driven products such as the OXO peeler move into the upper right.

Cagan: You can't just throw an engineer and a designer together and say, Create something in the upper right. There has to be a commitment to do the proper research, and you have to understand the needs and desires of your target market. You have to understand what the opportunity gap is by scanning the social and technology factors and then understand what that gap means -- so that when you create a new product, you're bridging that gap. You have to do something significant to get into the upper right. That's why we call it the "sheer cliff of value."

Vogel: To scale that cliff, you also have to commit yourself to a comprehensive way of working. In the fuzzy front end, there is a lot of trial and error, and you have to be ready for the fact that there are going to be a lot of misses. You need to have people thinking across disciplines and thinking about innovation. What we've seen is that it takes a different sort of commitment to do that.

Now let's look at the Rotato Potato Peeler, which falls into the lower-right quadrant. It is a technically driven peeler, the latest incarnation of the frightening 19th-century mechanical peelers with exposed blades.

Cagan: As seen on TV!

Vogel: Companies often try to improve on the generic product simply by adding new technology. Add more gadgets, and make it spin, electrify it, or hand-power it. The Rotato supposedly reduces the amount of labor -- but it also takes off at least an eighth of the vegetable.

Cagan: Plus, the Rotato is cumbersome to use. And it's ugly. You don't really get very much lifestyle impact.

Vogel: But the American ethic says, If you add more technology, it's always better. If you add a power train or a turbo boost, you've automatically improved it.

Cagan: The Rotato has an electric arm!

Vogel: Applying technology to everything isn't always the best solution. And that's what's proven. If you see the Rotato, you might be captivated. My daughter loves it. She wants one of these. But it doesn't create lasting value.

Cagan: That's not to say you can't have a high-tech product in the upper right -- but the technology should match up with the application. The Apple iMac is a good example. While most personal computers come with lots of features and aren't that easy to use, the iMac has taken an alternative approach, which is virtually the opposite. It comes with a Zen philosophy: Let's be minimalist and give people what they need -- and only that.

Staying in the Upper Right

Design problem: Create new value from an old standard. A Black & Decker engineer happened

upon the opportunity in his own workshop. He needed a hands-free rechargeable task light that was flexible and could wrap around objects. The SnakeLight debuted in 1994, supported by heavy TV advertising. At the time, Black & Decker projected sales of 200,000 units in the first year. It sold over 600,000. In fact, it took 18 months to catch up with demand.

Cagan: To stay in the upper right, you have to keep injecting useful, usable, and desirable features. Take the latest OXO peeler. It still has a good grip, but this updated version integrates brushed steel, which is a more contemporary look.

Vogel: In certain markets, the upper-right quadrant has been less sustainable than others. But the OXO Swivel Peeler has been remarkably sustainable.

Consider Motorola's Talkabout two-way radio. This was a great upper-right product, but it was instantly challenged by companies that were in the walkie-talkie industry and that were wired to compete. They started producing cheaper knockoffs. Motorola had been making huge profits as a result of the Talkabout, and it had to lower prices very quickly to stay competitive.

Cagan: Here's another example: Look at the SnakeLight. Black & Decker did a great job with patents, but it didn't continue to inject useful, usable, and desirable changes into the product. It dominated the market for four years -- but eventually, it lost market share.

Vogel: It wasn't that the competition was so great. Here's one knockoff: the Pretzl Lite, which is so bad, it's not even in the upper left. It doesn't work well; it looks terrible. But it managed to disguise its problems. When you see the Pretzl Lite in its package, you don't realize all that. The Pretzl Lite successfully drafted off of the SnakeLight's success. So even though the knockoffs were sued successfully, they created a lower-end market segment where people decided that they didn't have to pay as much. As a result, when the knockoffs didn't work, it hurt the credibility of the SnakeLight. And then Black & Decker didn't add any features. After four years, everyone who wanted one already had one.

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Sidebar: Value Opportunities

In *Creating Breakthrough Products*, Craig Vogel and Jonathan Cagan identify seven classes of attributes that can create value by contributing to a product's usefulness, usability, and desirability -- all of which create an experience that fulfills a consumer's fantasy.

Emotion: The perceptual experience that a consumer has when using a product. It can include a sense of adventure, independence, security, or sensuality.

Aesthetics: A focus on sensory perception, including the visual form, tactile interactions, and auditory, olfactory, and gustatory signals.

Product Identity: A statement about individuality and personality, expressing uniqueness, timeliness of style, and appropriateness in the context.

Impact: The social or environmental effects, which are connected with the customer's personal value system and can often help build brand loyalty.

Ergonomics: A product's basic usability reflects its ease of use from both a physical and a cognitive perspective. It must also be safe and comfortable.

Core Technology: The ability to function properly and perform to expectations. It must be reliable enough to work consistently.

Quality: The durability, precision, and accuracy of manufacturing processes, material composition, and methods of attachment must all meet the customer's expectations.

