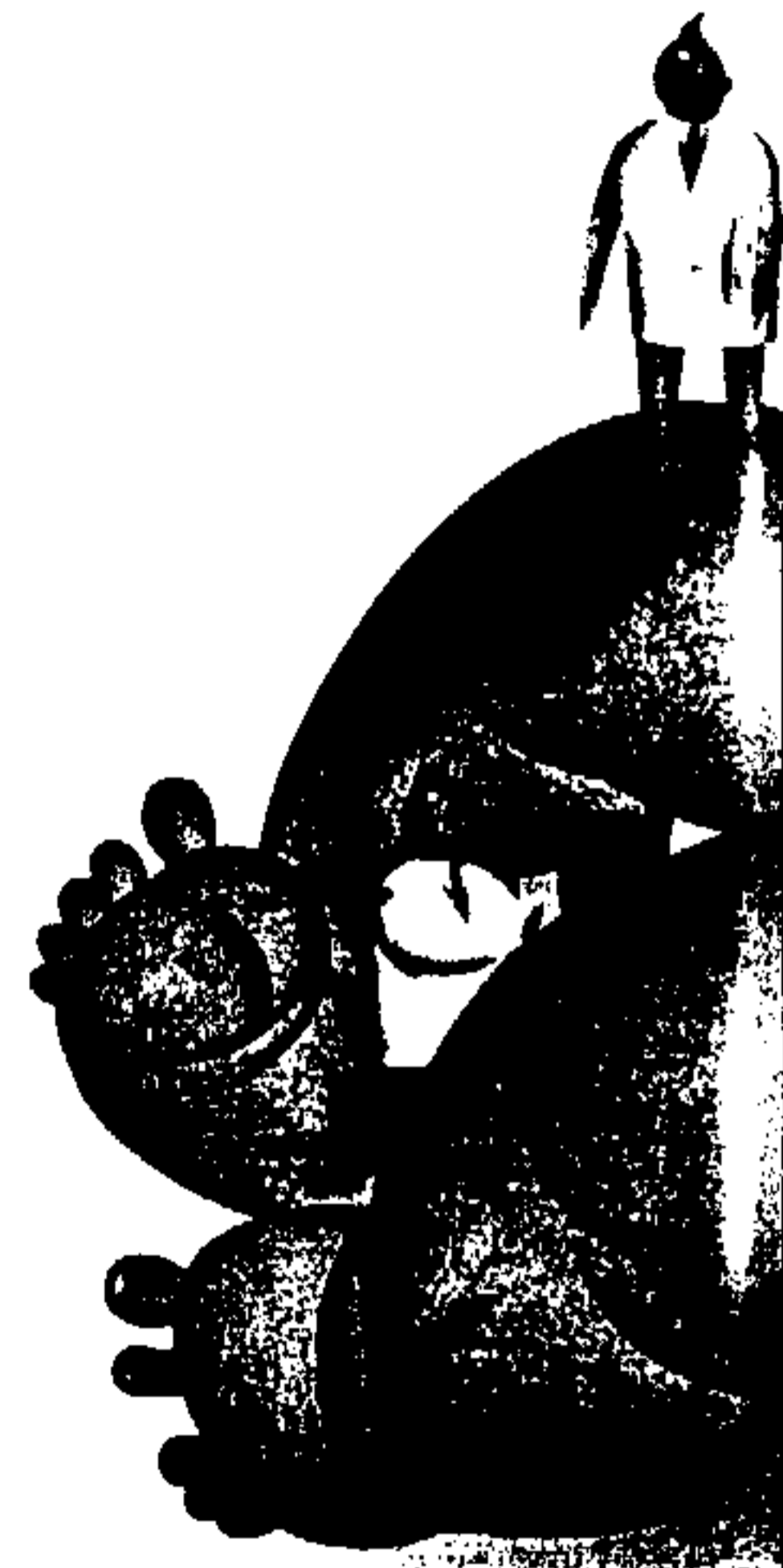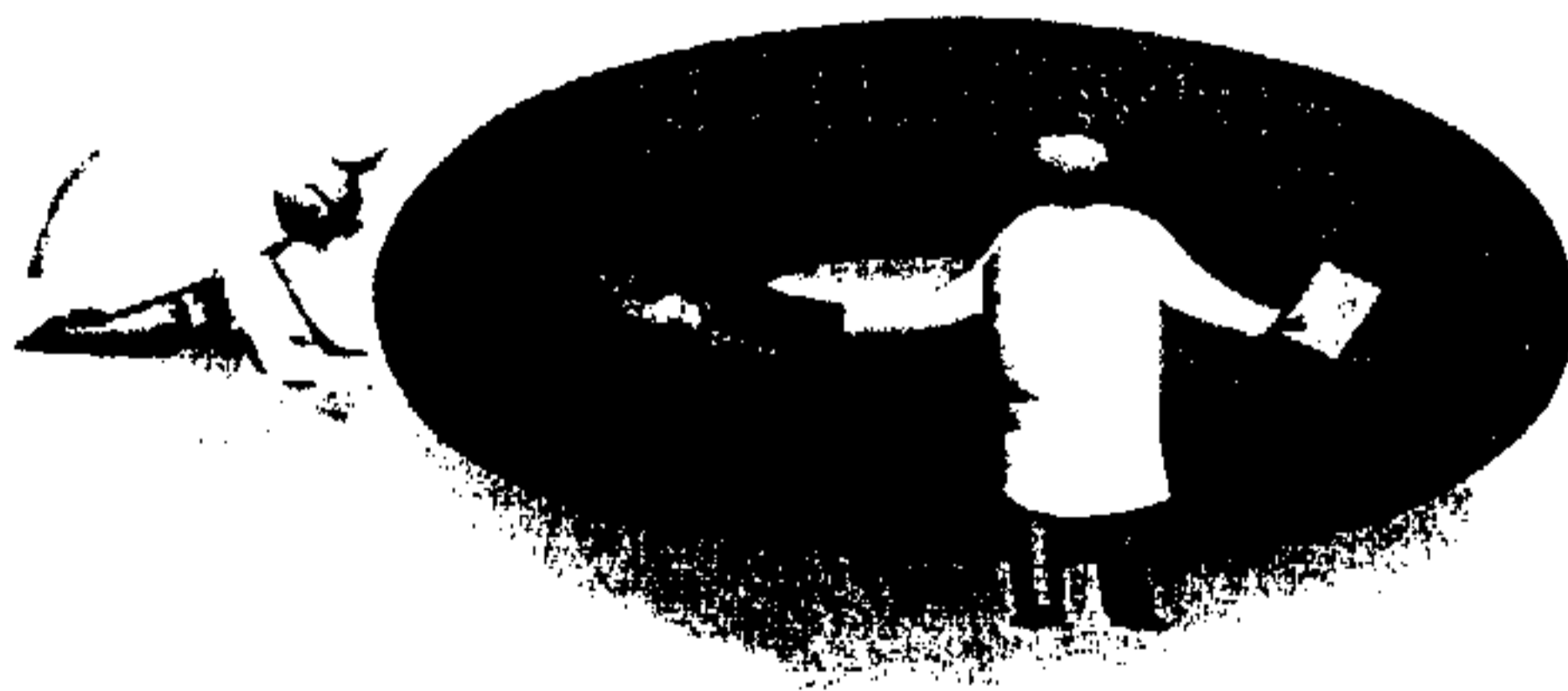*What customers can't tell you might be just what
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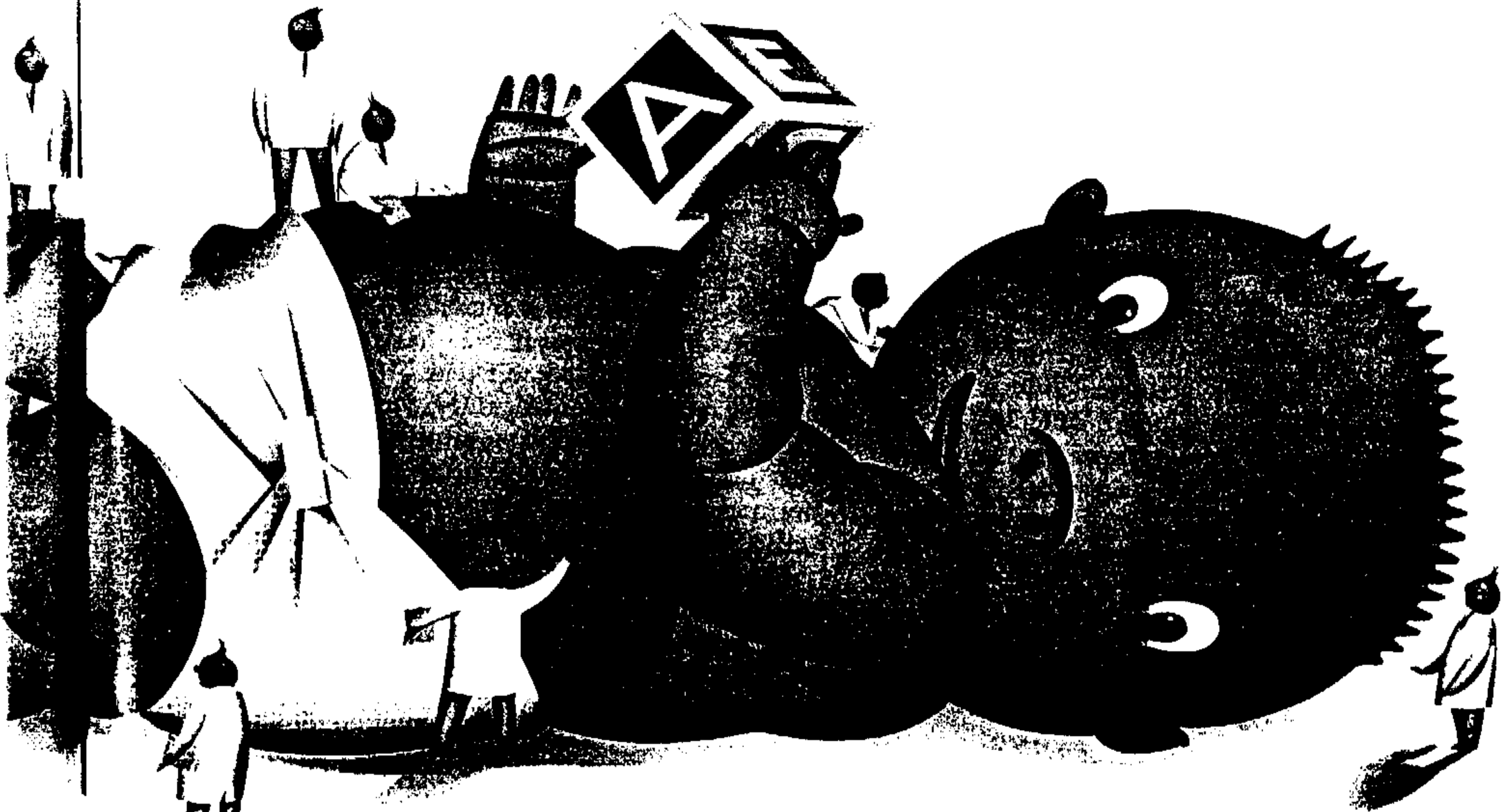
SPARK INNOVATION
THROUGH
EMPATHIC DESIGN

BY DOROTHY LEONARD AND JEFFREY F. RAYPORT

ALMOST EVERY COMPANY COMPETES to some degree on the basis of continual innovation. And to be commercially successful, new product and service ideas must, of course, meet a real – or perceived – customer need. Hence the current managerial mantras: "Get close to the customer" and "Listen to the voice of the customer." The problem is, customers' ability to guide the development of new products and services is limited by their experience and their ability to imagine and describe possible innovations. How can companies identify needs that customers themselves may not recognize? How can designers develop ways to meet those needs, if even in the course of extensive market research, customers never mention their desires because they assume those desires can't be fulfilled?

A set of techniques we call *empathic design* can help resolve those dilemmas. At its foundation is observation – watching consumers use products or services. But unlike in focus groups, usability laboratories, and other contexts of traditional market research, such observation is conducted in the customer's own environment – in the course of normal, everyday routines. In such a context, researchers can gain access to a host of information that is not accessible through other observation-oriented research methods.

The techniques of empathic design – gathering, analyzing, and applying information gleaned from observation in the field – are familiar to top engineering/design companies and to a few forward-thinking manufacturers, but they are not common practice. Nor are they taught in marketing courses, being more akin to anthropology than marketing

Sometimes, customers are so accustomed to current conditions that they don't think to ask for a new solution.

science. In fact, few companies are set up to employ empathic design; the techniques require unusual collaborative skills that many organizations have not developed. Market researchers generally use text or numbers to spark ideas for new products, but empathic designers use visual information as well. Traditional researchers are generally trained to gather data in relative isolation from other disciplines; empathic design demands creative interactions among members of an interdisciplinary team.

Developing the expertise, however, is a worthy investment. Empathic design is a relatively low-cost, low-risk way to identify potentially critical customer needs. It's an important source of new product ideas, and it has the potential to redirect a company's technological capabilities toward entirely new businesses.

When Questions Don't Yield Answers

When a product or service is well understood, traditional marketing science provides amazingly sophisticated ways to gain useful information from potential customers and influence their purchasing decisions. Consider how subtle are preferences of smell and sound, yet car manufacturers can design automobile interiors to evoke the specific scent of expensive leather that U.S. buyers expect in a luxury vehicle. Nissan Design International tested more than 90 samples of leather before selecting 3 that U.S. noses preferred for the Infinity J-30. Similarly, manufacturers are adept at fine-tuning engines so that they make the preferred sounds associated with surging power and swift acceleration. Harley-Davidson, in fact, has sued competitors that have imitated the voices of its motors, which have been carefully adjusted to please its customers'

ears. Customers can guide an auto or motorcycle manufacturer in making even minute adjustments in its offering because they are familiar with the products and have developed over time a finely honed set of desires and perceived needs. In fact, the driving experience is so deeply ingrained that they can re-create most of the needs they encounter while on the road even when they are not actually in the driver's seat.

The practices of traditional marketing science are also effective in situations where consumers are already familiar with a proposed solution to a problem because of their experiences with it in a different context. Peel-away postage stamps were an innovation that customers could comprehend because they had already encountered the light adhesives used in Post-it Notes and peel-away labels.

But sometimes, customers are so accustomed to current conditions that they don't think to ask for a new solution – even if they have real needs that could be addressed. Habit tends to inure us to inconvenience; as consumers, we create "workarounds" that become so familiar we may forget that we are being forced to behave in a less-than-optimal fashion – and thus we may be incapable of telling market researchers what we really want.

For example, when asked about an editing function in a software package, one customer had no complaints – until she sat down to use the program in front of the observer. Then she realized that her work was disrupted when the program did not automatically wrap text around graphics while she edited. Accustomed to working around the problem, she had not mentioned it in earlier interviews.

Market research is generally unhelpful when a company has developed a new technological capability that is not tied to a familiar consumer paradigm. If no current product exists in the market that embodies at least the most primitive form of

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a new product, consumers have no foundation on which to formulate their opinions. When radio technology was first introduced in the early twentieth century, it was used solely for transmitting Morse code and voice communication from point to point. Only after David Sarnoff suggested in 1915 that such technology could be better employed in broadcasting news, music, and baseball games was the "radio music box" born. Sarnoff had put his knowledge of the technology together with what he found when he observed families gathered in their homes to envision a totally different use for the technology. No one had asked for broadcasting because they didn't know it was feasible.

So there are many reasons why standard techniques of inquiry rarely lead to truly novel product concepts. It is extremely difficult to design an instrument for market research that is amenable to quantitative analysis and also open-ended enough to capture a customer's environment completely. Market researchers have to contend with respondents' tendency to try to please the inquirer by providing expected answers, as well as their inclination to avoid embarrassment by not revealing practices they suspect might be deemed inappropriate. The people who design surveys, run focus groups, and interview customers further cloud the results by inadvertently – and inevitably – introducing their own biases into the questioning. When a customer's needs are solicited in writing or through constrained dialogue, pummeled with statistical logic, and delivered to product developers in compressed form, critical information may be missing. But why would observation be a better approach?

What We Learn from Observation

Watching consumers has always yielded obvious, but still tremendously valuable, basic information. Consider usability: Is the package difficult to open? Does the user have to resort to the manual, or are operating principles clearly telegraphed by the design? Are handles, knobs, and distances from the floor designed ergonomically? Does the user hesitate or seem confused at any point? What unspoken and possibly false assumptions are guiding the user's interaction with the product?

You can easily get that sort of feedback by watching people work with your products in usability labs and by testing for various ergonomic requirements. It is the additional information gained from seeing your customers actually use your product or service in their own physical environment that makes empathic design an imperative. Empathic-design techniques can yield at least five types of

information that cannot be gathered through traditional marketing or product research.

Triggers of Use. What circumstances prompt people to use your product or service? Do your customers turn to your offering when, and in the way, you expected? If they don't, there may be an opportunity for your company.

Consider what Hewlett-Packard learned in the early 1990s by observing users of the HP 95/100 LX series of personal digital assistants (PDAs). The company allied itself with Lotus Development Corporation to produce the PDA mainly because its product developers knew that their "road warrior" consumers valued the computing power of Lotus 1-2-3 spreadsheet software. But when HP's researchers watched customers actually using the product, they found that the personal-organizer software the company had also licensed from Lotus was at least as important a trigger for using the PDA as the spreadsheet was.

When the makers of Cheerios went out in the field, they found that breakfast wasn't necessarily the primary purpose for which certain households were using the cereal. Parents of small children, they found, were more interested in the fact that the pieces could be bagged, carried, and doled out one by one as a tidy snack anytime, anywhere to occupy restless tots.

And when the brand manager for a spray-on cooking oil saw his neighbor using the product on the bottom of his lawn mower, he discovered an entirely unexpected trigger. Pressed to explain, the neighbor pointed out that the oil prevented cut grass from adhering to the bottom of the mower and did no harm to the lawn. Such unanticipated usage patterns can identify opportunities not only for innovation and product redesign but also for entering entirely new markets.

Interactions with the User's Environment. How does your product or service fit into your users' own idiosyncratic systems – whether they be a household routine, an office operation, or a manufacturing process? Consider what Intuit, maker of the personal-finance software package Quicken, learns through its "Follow Me Home" program, in which product developers gain permission from first-time buyers to observe their initial experience with the software in their own homes. Intuit, of course, learns a good deal about its product's packaging, documentation, and installation from this exercise, as well as about the user friendliness of its software. But it can gather that kind of information in a usability laboratory. What Intuit can't reliably learn in any way other than by watching someone boot up Quicken on a home computer is what other

software applications are running on that customer's system and how that software can interfere with or complement Quicken's own operation. Moreover, product developers can see what other data files the customer refers to and might wish to access directly, what state of organization or disarray such files are in, and whether they are on paper or in electronic form. It was from such in-home observations that Intuit designers discovered that many small-business owners were using Quicken to keep their books.

Some small changes that can result from watching people use your product in their own environment can also be competitively important. When engineers from a manufacturer of laboratory equipment visited a customer, they noticed that the equipment emitted a high level of air pollution when it was being used for certain applications. That observation motivated the company to add a venting hood to its product line. Current users were so accustomed to the unpleasant smell that they had never thought to mention it and didn't regard a venting hood as an important enhancement – until it was available. Then the company's sales force found the hood to be a compelling sales point when customers compared the product with those of competitors.

User Customization. Do users reinvent or redesign your product to serve their own purposes? Producers of industrial equipment observed users taping pieces of paper to their product to serve as identifying labels. The manufacturer gained an inexpensive, but appreciable, advantage over the competition when it incorporated a flat protected space for such machine-specific information into its next model. And every Japanese automaker has set up a design studio in southern California because fanatical car owners there are prone to modi-

Sometimes, users combine several existing products to solve a problem, not only revealing new uses for traditional products but also highlighting their shortcomings. A prominent producer of household cleaners handed video cameras to family members to record how its products were really being used in people's basements. The company then could see homemakers concocting their own recipes for particular household chores, such as washing white curtains ("one cup baking soda, one cup dishwashing detergent," and so on).

Similarly, in the course of studying consumers' mobile-communication needs, consultants at the Chicago-based Doblin Group, observed individuals creatively combining beepers and cell phones so they could be just as available as they wished – and no more. These consumers gave special beeper codes to friends and relatives to screen out undesired interruptions. That suggested to the firm the need for filtering capabilities on cell phones.

Intangible Attributes of the Product. What kinds of peripheral or intangible attributes does your product or service have? Customers rarely name such attributes in focus groups or surveys, but those unseen factors may constitute a kind of emotional franchise – and thus an opportunity. When watching videos of homemakers using cleansers and detergents, representatives of the household-products company could see how often the smell of the products evoked satisfaction with their use, engendered feelings of nostalgia ("My mother used this") or elicited other emotional responses ("When it smells clean, it makes all my work worthwhile").

Such intangible, invisible product assets can be augmented, exploited, or redirected. After visiting the homes of Kimberly-Clark customers, consultants at the Palo Alto, California-based design firm GVO recognized the emotional appeal of pull-on diapers to parents and toddlers, who saw them as a step toward "grown-up" dress. Diapers were clothing, the observers realized, and had highly symbolic as well as functional meaning. Huggies Pull-Ups were rolled out nationally in 1991, and by the time competitors caught on, the company was selling $400 million worth of the product annually.

Failing to note such intangible attributes can sink a new product. Environmentally friendly disks that clean washer loads of clothes without detergents have yet to attract a mass market – in large part, according to the Doblin Group's observational research, because they don't produce the expected clean-clothes smell.

> Observers saw people combining beepers and cell phones not to answer calls but to screen them.

fying their cars, often substantially, to meet their particular desires, be they functional (more cargo space, larger engines) or ego-intensive (spoilers, special wheels, new colors). Observing these users helps designers at Nissan and Toyota envision the potential evolution of specific models – and gives them a window on the possible future of cars and trucks in general.

Unarticulated User Needs. The application of empathic design that holds the greatest potential benefit is the observation of current or possible customers encountering problems with your products or services that they don't know can be addressed and may not even recognize as problems. What do you see people being unable to do that would clearly be beneficial?

A product developer from Hewlett-Packard sat in an operating room observing a surgeon at work. The surgeon was guiding his scalpel by watching the pa-

couple at the side of the road wrestling the back seat of a competitor's minivan out of the way so they could pick up a new couch. "We bought this so we would have room," they told him, "but we can't use it for what we want without taking out the seats." They would never have thought of asking for any solution to their problem, but one immediately occurred to Hirshberg – six-foot runners that would enable van owners to fold up the back-seats and slide them out of the way, thus easily creating cargo room.

tient's body and his own hands displayed on a television screen. As nurses walked around the room, they would periodically obscure the surgeon's view of the screen and the operation for a few seconds. No one complained. But this unacknowledged problem caused the developer to ponder the possibility of creating a lightweight helmet that could suspend the images a few inches in front of the surgeon's eyes. Her company had the technology to create such a product. The surgeon would never have thought to ask for it, even though its potential to improve productivity, increase accuracy, and make the surgeon's work easier was substantial.

Unarticulated needs abound in daily routines, even when a technological solution exists. For example, Nissan Design's president, Jerry Hirshberg, was driving along a freeway one day when he saw a

Weyerhaeuser won an important advantage in the market for particle board after observing an unarticulated need during a visit to a customer's plant. The customer, a major furniture maker, created table legs by laminating together narrow boards produced by some of Weyerhaeuser's competitors. Unable either to match the competitors' prices or to convince the customer to pay higher prices for superior quality, Weyerhaeuser instead came up with a new way to make table legs – a new, much thicker particle board that did not have to be laminated. The consequent savings to customers in tooling and labor costs put Weyerhaeuser back in the competitive running.

Some stunning product ideas come from an engineer or designer who actually uses the products he or she develops because this individual combines

knowledge of unexpressed needs with knowledge of how to fill those needs. U.S. women were annoyed for years by the inappropriateness of using a man's safety razor, designed for faces, on their underarms and legs. When a female designer reshaped the razor for a woman's hand and needs – the Gillette Lady Sensor – it was enormously successful.

The oft-repeated advice to "delight the customer" assumes real meaning when product or service providers push beyond what their customers

Empathic-design techniques can't replace market research; rather, they contribute to the flow of ideas that need further testing.

anticipate to deliver the unexpected – and technology is a primary agent of such delight. But all companies have capabilities they are failing to tap in their quest to create innovative products and services because those who know what *can* be done are not generally in direct contact with those who *need* something done. Empathic-design techniques thus exploit a company's existing technological capabilities in the widest sense of the term. When a company's representatives explore their customers' worlds with the eyes of a fresh observer while simultaneously carrying the knowledge of what is possible for the company to do, they can redirect existing organizational capabilities toward new markets. Consider it a process of mining knowledge assets for new veins of innovation. Usually, much of the basic underlying technology or service methodologies already exist; they just need to be applied differently.

One important note: empathic-design techniques cannot replace market research; rather, they contribute to the flow of ideas that need further scientific testing before a company commits itself to any full-fledged development project.

Empathic Design: the Process

Companies can engage in empathic design, or similar techniques such as contextual inquiry, in a variety of ways. However, most employ the following five-step process:

Step One: Observation. It's important to clarify who should be observed, who should do the observing, and what the observer should be watching.

Who should be observed? These individuals may be customers, noncustomers, the customers of customers, or a group of individuals who by playing different roles collectively perform a task.

Hewlett-Packard makes protocol analyzer software that enables managers of computer operations to diagnose network malfunctions. As networks became more complex, smaller companies began to offer customized software for the idiosyncratic needs of some of HP's customers. In response, HP designers conducted extensive market research, which resulted in a cacophony of requests to expand the types of data the analyzers could track and report on. Not only did that make product development much more difficult, it also failed to make the products any more effective. Users became inundated with data that they couldn't turn into useful information. HP developers decided to stop focusing on their traditional customers, the operations managers. Instead, they watched, among others, network maintenance technicians at work.

From those observations, the developers discovered that what their customers really needed was not, as they had been told, more data to analyze. Rather, users needed to recover swiftly from computer crashes. That change in perspective led to a shift in technological emphasis. The result was HP's highly successful Network Advisor, which de-emphasizes data collection, analysis, and reports. Instead, it identifies the network problem, recommends a solution, and suggests ways to implement the solution quickly.

Who should do the observing? Differences in training, education, and natural inclinations predispose different people to extract very different information when watching the exact same situation. A human-factors specialist may note body positions; an engineer may notice angles and mechanical interactions; a designer may see spaces and forms. Of course, many people are multiskilled observers, but the best way to capture the most important aspects of an environment is to send out a small team, each member of which has expertise in a different discipline. That's what the design firm IDEO did for Details, a subsidiary of the office-equipment supplier, Steelcase. To help Details develop a more easily repositioned computer keyboard, IDEO sent a human-factors expert, an engineer, and a designer on anthropological expeditions into office buildings. Each team member brought back a notebook full of very different data.

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Observing in Cyberspace

The techniques of empathic design are a natural for the physical marketplace: watching customers use a product or service in their own homes or offices provides a wealth of information about possible innovations in real time and with little or no distortion. But empathic design also has great potential in the virtual world, or the "marketspace." Increasingly, people conduct business transactions—from banking and investing to purchasing and installing software packages—through cyberspace. Observing behavior in that virtual realm can yield many of the same benefits as observation in the physical world. In fact, in many situations, the virtual form of empathic design can result in speedier, more targeted innovation because companies can "watch" many more people at any given time in cyberspace and spot needs and trends at the very instant they emerge.

For example, software developers are increasingly taking advantage of "plug-ins"—small modules of computer code that they can download directly from the Web through their Internet browsers and combine together to make larger applications. Microsoft and Netscape are highly interested in which plug-ins their customers are downloading via their respective browsers, Internet Explorer or Netscape Navigator. Both companies can directly observe users running the plug-ins, gaining clues about emerging customer needs. For example, many browser users have recently begun to experiment with Internet telephony—that is, they have begun to use software from companies such as VocalTec Communications to make long-distance phone calls for free over the Web. Responding to this trend, Microsoft and Netscape now offer browsers with Internet telephony built in.

Similarly, software designers, who often conduct beta tests of new products on the Web with large groups of "techies," have access to enormously varied virtual discussions about their products. Every time a company releases a beta version of software on the Web and invites hackers to find bugs, identify flaws, and suggest improvements, that company can harvest insights into future needs by observing how users customize and critique their products.

And the success of America Online can be attributed in part to the fact that its managers understood and acted on what they found when they observed customers' usage patterns. Originally, managers had believed that information services would drive their business, but they found that those offerings were not what users valued most. Rather, users valued the ability to communicate through virtual channels with one another. So AOL invested aggressively in creating venues for social interaction, ranging from chat rooms and E-mail to buddy lists and event forums.

When AOL has ignored the wisdom of observing and listening to its markets, it has stumbled badly. Witness the recent consumer backlash that occurred when the commercial on-line service announced that it would sell the phone numbers of its 8.5 million users to telemarketers for a hefty sum. It pays to stay close to users through physical or digital observation as they use or experience the product or service.

Of course, the techniques of empathic design do not translate directly from the physical world to the virtual one. In fact, some would argue that "observation" in the marketspace is simply capturing data. And to an extent it is, since all observation ultimately becomes a source of data about users. But data represent behavior. And therein lies much untapped potential—untapped because the techniques of empathic design demand a much more intensive approach to those data than most companies currently take. Empathic design requires researchers to think about a body of data as a window into consumers' behavior and then to use that information as the basis for innovation. That requires a substantial investment in reflection and analysis—something many companies have not yet made.

Companies observing in cyberspace also face the issue of where to draw the line when it comes to privacy. Observation in the marketspace is by nature unobtrusive and can be perceived as invasive. Customers do not want to be spied on. It is important to consider what customers may consider an invasion of privacy and when the customer should be allowed to set the boundaries on a company's observations. The Microsoft Network software originally scanned and reported back to Microsoft the other programs its users had on their hard drives. The purpose of the observation ostensibly was to help Microsoft make its products compatible with other vendors' software. But customers raised concerns about privacy, and the practice was discontinued.

It is worthwhile for companies to address that issue and to explore the potential of empathic-design techniques in the marketspace. Not only is it straightforward and inexpensive to observe customers' behavior in the virtual world, but many companies are already collecting the raw material they need, whether they know it or not, simply by virtue of their on-going activities in marketspace channels. Every move that consumers make in the virtual world leaves a digital fingerprint; collectively, those prints form a trail that outlines needs and desires, pointing the way toward successful innovation.

Because a critical objective of such an expedition is to match the unarticulated needs of users with technological possibilities, at least one member of any team should have experience in behavioral observation and another should have a deep understanding of the organizational capabilities the development team can draw upon. When the team comes from an outside consulting firm, some of the client's employees should be included to provide that deep understanding. The Doblin Group, for example, was challenged to redefine the travel experience for SAS. It convened a very large team that included not only social scientists and information designers but also pilots and flight attendants from the airline. The airline employees understood SAS's capabilities in depth and also knew how proposed service innovations might require changes not just in operations but also in corporate culture.

Few organizations have large numbers of employees capable of conducting such anthropological expeditions. When asked what characteristics members of empathic-design teams should have,

Nissan designers were startled to see how many people were eating in trucks – not just drinks, but whole spaghetti dinners.

managers that employ those techniques list ones rarely found on most résumés: open-mindedness, observational skills, and curiosity. Human resource departments are not set up to screen for such abilities. Some companies, such as Intel and Xerox, have hired cultural anthropologists and social psychologists for their research, marketing, or product development departments because they are trained observers who have demonstrated an interest in human behavior. Other organizations outsource this kind of work to design firms, knowing that there are employees in such specialty companies with a variety of skills: experts in human factors, in graphics and visual design, and in engineering.

What behavior should be observed? The people being observed should be carrying out normal routines – playing, eating, relaxing, or working at home or at the office. For its research on mobile communications, the Doblin Group followed a lawyer from the moment she left her children at their day care center in the morning until after the children were in bed that night, revealing a wealth of communication needs that are often overlooked. Few people, of course, are totally oblivious to a team of people hanging over their shoulders, observing them at work or play. But a real-life atmosphere – even a slightly stilted one – is still better than the highly artificial setting of a focus-group conference room or a laboratory. For some products and services, team members may conduct their observations in a highly unobtrusive way simply by planting themselves in a public setting where people are going about their normal routines and watching behaviors more systematically than the usual sidewalk observer generally does.

Step Two: Capturing Data. Because empathic-design techniques stress observation over inquiry, relatively few data are gathered through responses to questions. (See the exhibit "Inquiry Versus Observation: What's Different?") When they wish to know how to interpret people's actions, observers may ask a few very open-ended questions, such as "Why are you doing that?" They often carry a list of questions to prompt their own observations – for example, "What problems is the user encountering?" But most data are gathered from visual, auditory, and sensory cues. Thus empathic-design teams very frequently use photography and videography as tools.

Video can capture subtle, fleeting body language that may convey large amounts of information and store it for future review and analysis. For more than a decade, researchers at Xerox PARC, the Xerox Palo Alto Research Center, have videotaped users when they were confronted with a product such as a new copier machine. The researchers can see puzzled looks on the subjects' faces, they watch as people search for controls, and they can observe the kinds of automatic responses that happen when someone expects a control to be here or there and it is not. Such cues come and go within the span of mere seconds and are hard to capture in notes.

Even still photographs convey information that can be lost in verbal descriptions. Nissan Design International commissioned a photographer to travel to several cities and take pictures of people in trucks to better understand how they were being used as commuter and family cars. NDI designers were startled to discover how little their trucks (and those of competitors) were actually being used for the purposes being advertised and reported in market surveys. NDI president Hirshberg was surprised to see how many people were eating in trucks, recalling "not just drinks, but whole spa-

ghetti dinners!" The designers also noticed how much people resembled their vehicles and how scuffed up some of the vehicles were. They began to wonder if some vehicles should be more like denim and look better the more worn they got.

Photographs or drawings (which artists and designers can produce on the spot) show spatial arrangements and contain details that may have gone unnoticed while the team was on location. When members of one observation team displayed on a bulletin board all the candid photos they took of the people they observed in an office building, they were struck by the snake pit of wires in which everyone's feet were stuck. That led their company to build in conduits for those wires in its next generation of dividers for modular offices. And pictures of backyard barbecues taken for the developers from the Thermos company who were working on a new charcoal grill showed women struggling with equipment designed for the generally greater height

Inquiry Versus Observation: What's Different?

Inquiry

1. People can't ask for what they don't know is technically possible.

2. People are generally highly unreliable reporters of their own behavior.

3. People tend to give answers they think are expected or desired.

4. People are less likely to recall their feelings about intangible characteristics of products and services when they aren't in the process of using them.

5. People's imaginations – and hence their desires – are bounded by their experience; they accept inadequacies and deficiencies in their environment as normal.

6. Questions are often biased and reflect inquirers' unrecognized assumptions.

7. Questioning interrupts the usual flow of people's natural activity.

8. Questioning stifles opportunities for users to suggest innovations.

Observation

1. Well-chosen observers have deep knowledge of corporate capabilities, including the extent of the company's technical expertise.

2. Observers rely on real actions rather than reported behavior.

3. People are not asked to respond to verbal stimuli; they give nonverbal cues of their feelings and responses through body language, in addition to spontaneous, unsolicited comments.

4. Using the actual product or a prototype, or engaging in the actual activity for which an innovation is being designed, stimulates comments about such intangibles as smells or emotions associated with the product's use.

5. Trained, technically sophisticated observers can see solutions to unarticulated needs.

6. Observation is open ended and varied; trained observers tend to cancel out one another's observational biases.

7. Observation, while almost never totally unobtrusive, interrupts normal activities less than questioning does.

8. Observers in the field often identify user innovations that can be duplicated and improved for the rest of the market.

and upper body strength of men, who were (incorrectly) assumed to be the most likely outdoor family chefs.

Step Three: Reflection and Analysis. After gathering data in many forms, the team members return to reflect on what they have observed and to review their visual data with other colleagues. Those individuals – unhampered by possibly extraneous information, such as the reputations of the individuals or companies visited or the weather at the observation site – will focus on the data before them, and they, too, will see different things. They will ask questions that the team members may or may not be able to answer and that may well send them out for further observation. It is at this point that the team tries to identify all of its customers' possible problems and needs.

The IDEO team redesigning Lifeline Systems' personal-response unit for elderly people uncovered a potentially dangerous problem only after they shared their field data with colleagues. On leaving for an extended period, many users turned off their units so that Lifeline's monitoring staff would not mistake silence for an emergency. However, because the unit lacked an obvious status indicator, users often forgot to reactivate the units when they returned. The opportunity to improve the design was recognized by engineers who were not part of the original group of IDEO observers. Consequently, IDEO redesigned the product so that it indicated even to the vision impaired when it was turned off and automatically restarted when users tried to send their habitual "all is well" signals to the monitoring service.

Step Four: Brainstorming for Solutions. Brainstorming is a valuable part of any innovation process; within the empathic-design process, it is used specifically to transform the observations into

with a creative process, it is not undisciplined. Managers at IDEO tell their employees to heed five rules: defer judgment, build on the ideas of others, hold one conversation at a time, stay focused on the topic, and encourage wild ideas.

Such sessions are valuable not only for the ideas that pop up during the actual brainstorming session but also for the concepts and solutions that occur to people later, at home, because the seeds to them had been planted in their minds.

Companies that routinely hold brainstorming sessions as part of the empathic-design process need supporting infrastructure. That can be as low tech as a table covered in thick paper used for doodling and taking notes; when a session is over, team members can tear off the best ideas and take them home. It can be as high tech as the Idea Factory, a physical and virtual space being set up in San Francisco to help companies create next-generation products and business strategies. To facilitate collaborative work, the Idea Factory will boast workstations; customized groupware; and the latest white-board recording equipment, which can produce hard copies of whatever is written down or drawn on the board's surface.

Step Five: Developing Prototypes of Possible Solutions. Clearly, prototypes are not unique to empathic design. But the more radical an innovation, of course, the harder it is to understand how it should look, function, and be used. Just as researchers gather useful visual data, so too can they stimulate communication by creating some physical representation of a new concept for a product or service. Prototypes are a critical part of the empathic-design process for at least three reasons:

- Prototypes clarify the concept of the new product or service for the development team.
- They enable the team to place its concept in front of other individuals who work in functions not formally represented on the team.
- They can stimulate reaction and foster discussion with potential customers of the innovation because of their concreteness.

Sometimes, two prototypes are used, one that emulates the function but not the form, and another that illustrates the ideal physical appearance of the intended product but doesn't work. In designing the outdoor grill, Thermos's Lifestyle team produced two models, which they called the Monitor and the Merrimack (after the Civil War ships). The Monitor was a functioning prototype, but the team considered it ugly; the Merrimack was sleek and stylish but was actu-

> ## Photographs show spatial arrangements and details that may go unnoticed in the field.

graphic, visual representations of possible solutions. Design firms maintain that this step is often undervalued: "Our clients sometimes don't understand why brainstorming is expensive – and immensely productive – until they have sat in on a session. Then they usually go away shaking their heads, saying, 'Wow – that was really amazing!'" Although brainstorming is generally associated

ally an inert object made of plastic foam. The company used both models to elicit feedback from consumers and retailers.

Simulations are also useful prototypes. And they need not be as computer-intensive and elaborate as the University of Illinois's CAVE, which simulates the three-dimensional space of a room and can be programmed to represent different environments, such as a factory. In fact, many useful simulations are not computerized at all. When Chaparral Steel Company wanted to design metal splash guards to

apply their intensive knowledge of media possibilities within constraints that they could not otherwise personally experience (at least for some years).

Empathic Design as a Culture Shift

A common criticism of the kinds of innovative ideas arising through empathic design is, "But users haven't asked for that." Precisely. By the time they do, your competitors will have the same new-product ideas you have – and you will be in the
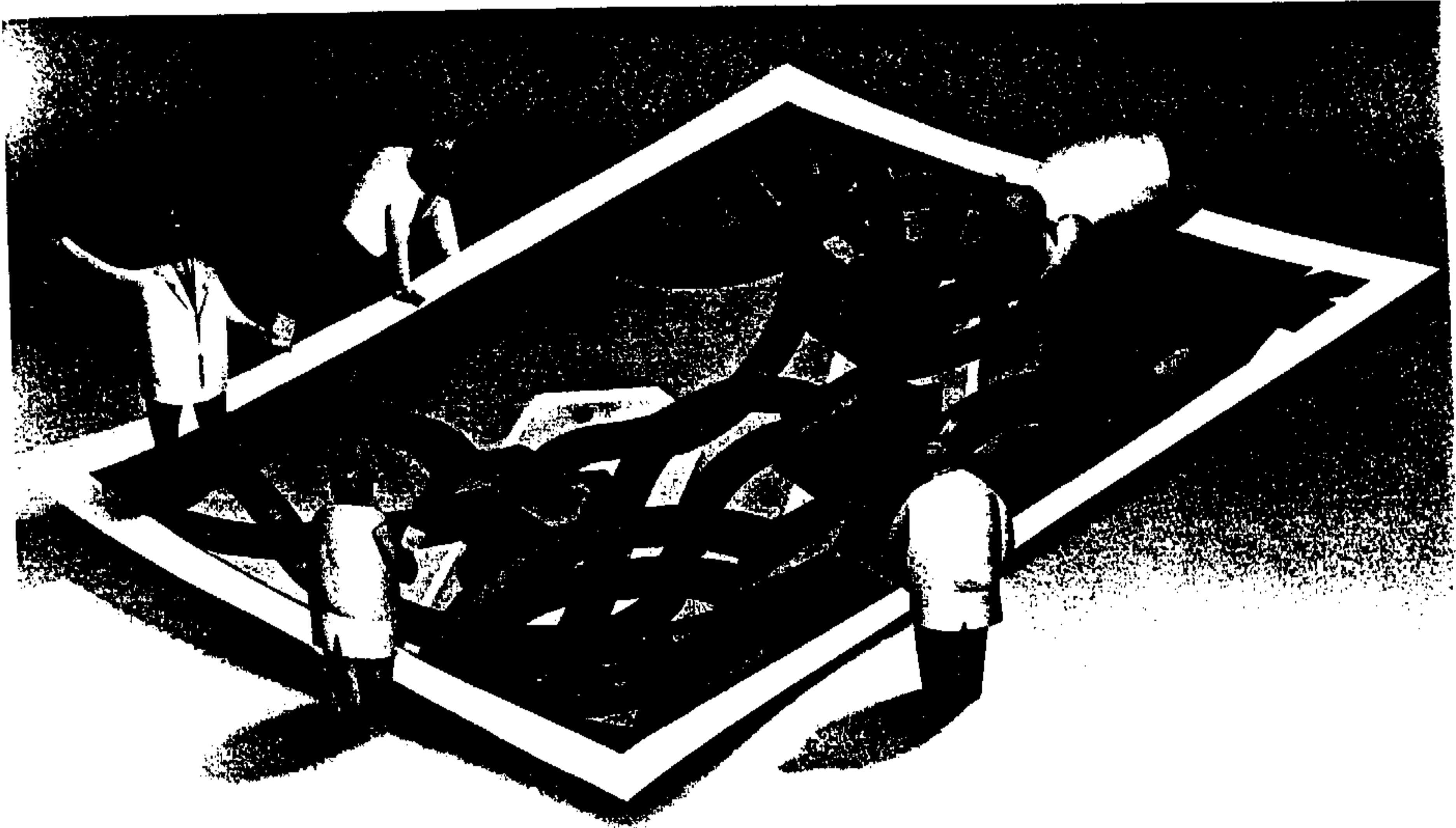
put along the path of the white-hot metal bars that were moving toward the rolling mill, they positioned waterlogged plywood at various angles and heights to simulate different designs. The plywood was rapidly consumed by the hot metal, but not before the experimenters could learn what design worked best.

Role-playing is also a form of simulation. At Interval Research Corporation of Palo Alto, California, young twenty-something media-interface designers were outfitted with fogged glasses, gloves, and weights on their arms and legs so they could feel what it would be like for the very elderly to work prototype physical controls or use hand gestures in the air as a way to control the next generation of TVs, VCRs, and other electronic equipment. That simulation allowed the young researchers to

"me-too" game of copying and improving their ideas. Empathic-design techniques involve a twist on the idea that new-product development should be guided by users. In this approach, they still do – they just don't know it.

Empathic design pushes innovation beyond producing the same thing only better. So for example, computer company managers who have been exposed to a deep cultural understanding of mobility no longer think only of making lighter, faster, and more durable laptops. Instead, they are challenged to consider other communication needs a portable computer might meet. Developing a deep, empathic understanding of users' unarticulated needs can challenge industry assumptions and lead to a shift in corporate strategy.

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