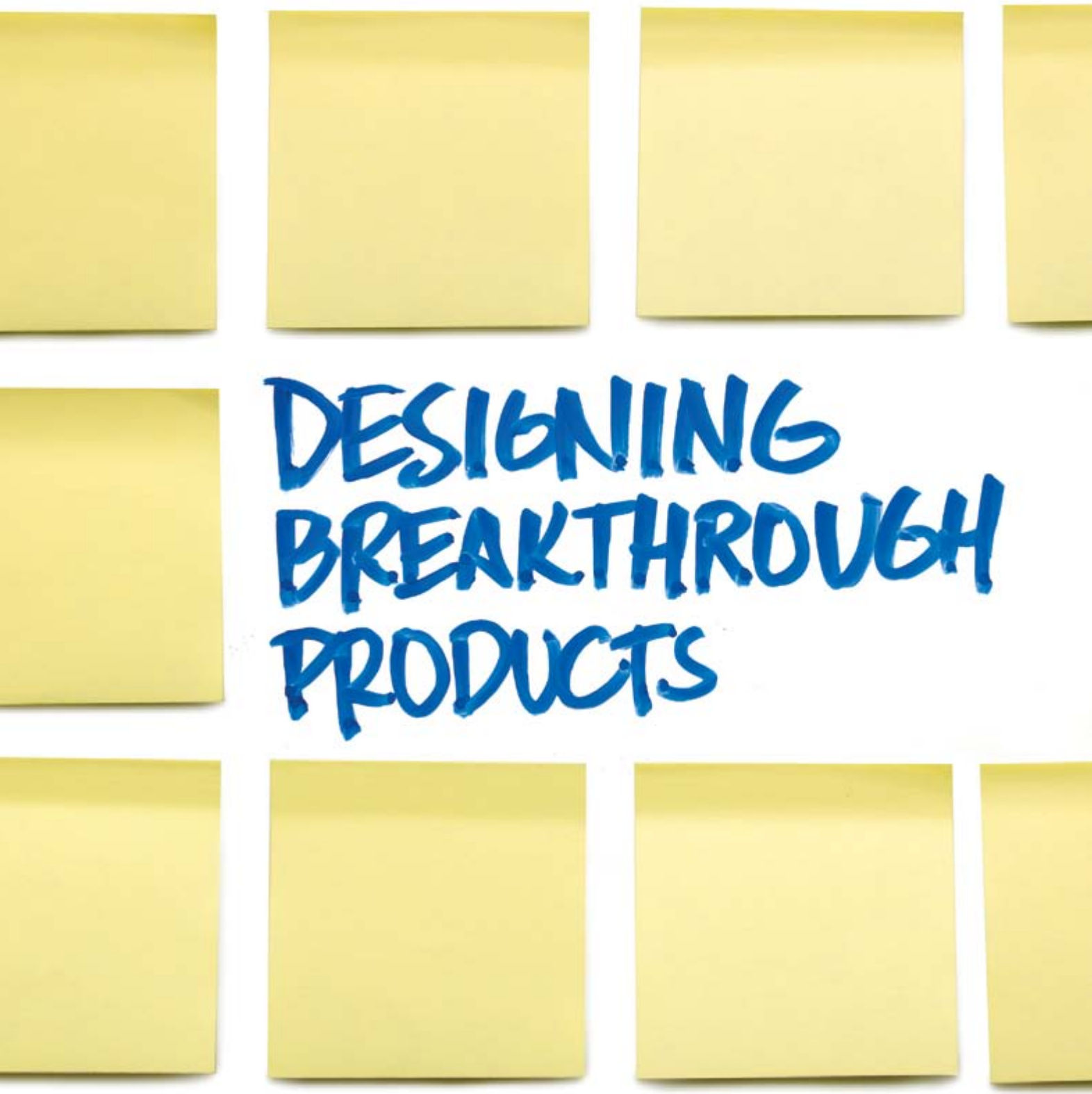
HBR.ORG

Harvard Business Review

OCTOBER 2011
REPRINT R1110H

Designing Breakthrough Products

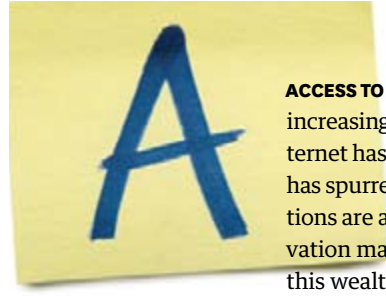
How companies can systematically create innovations that customers don't even know they want ***by Roberto Verganti***


DESIGNING
BREAKTHROUGH
PRODUCTS

Roberto Verganti is a professor of the management of innovation at Politecnico di Milano and the author of *Design-Driven Innovation* (Harvard Business Press, 2009).

How companies can systematically create innovations that customers don't even know they want

by Roberto Verganti



ACCESS TO TECHNOLOGICAL opportunities is becoming increasingly easy. Thanks to the collaboration the internet has made possible and the open innovation it has spurred, we live in a world where ideas and solutions are abundant. The main challenge facing innovation managers today is how to take advantage of this wealth of opportunities. Being first to launch a new technology is less important than being first to envision its greatest untapped market potential.

Well-known examples of companies that did the latter include Nintendo, Apple, and Swatch. All three have used technology to radically change the meaning of offerings in a category—why customers buy or how they use a product. Nintendo's clever application of MEMS (micro-electro-mechanical systems) accelerometers transformed the experience of playing with game consoles from passive immersion in a virtual world into active physical entertainment. Apple's creation of the iPod and the iTunes Store made it easier for people to discover and buy new music and organize it into personal playlists, and provided a solution to the piracy that was threatening to destroy the music industry. And Swatch used inexpensive quartz technology to change watches from timekeeping tools into affordable fashion accessories. These companies weren't necessarily the first to introduce a new technology in the product category (the iPod

PHOTOGRAPHY: ELIE HONEIN

was released in 2001, four years after the first MP3 player), but they unveiled its most meaningful and profitable form.

I call the strategies that led to these products *technology epiphanies.* An epiphany—"a perception of the essential nature or meaning of something"—is commonly thought of as a sudden revelation that comes to a lone creative genius in an intuitive fashion. But I propose that technology epiphanies do not have to be the result of rare eureka moments; they can be systematically produced by either the suppliers of new technologies or the companies that incorporate them in their offerings. I will demonstrate how by focusing on one best-practice company, Philips Electronics, which developed Ambient Experience for Healthcare, a breakthrough application for reducing the anxiety that patients often experience when they undergo medical scans with computed tomography (CT), magnetic resonance imaging (MRI), and other machines. Instead of assessing technologies in light of customers' existing needs, as conventional innovation processes do, Philips focused on developing a brand-new vision of the user experience. To do this, it assembled experts from a range of far-flung fields to interpret how the technologies might be employed, synthesized their interpretations into ideas for products, and created prototypes that could be tested with customers or users. Hospitals and patients hadn't asked for AEH, but once they experienced it, they loved it.

Philips's Search for Epiphanies

When exposed to new or emerging technologies, most companies focus on a narrow innovation strategy: *technology substitution.* The question they ask is, "Can we substitute this for an old technology to better address customers' existing needs?" But companies that pursue technology epiphanies ask, "Will this new technology enable us to create products and services that people find more meaningful than current offerings? Will it transcend existing needs and give customers a completely new reason to buy a product?"

Philips started to produce technology epiphanies in the early 1990s and has invested systematically in this strategy since 2001, when its leaders decided that the company was nowhere close to capturing the potential value of the abundant technology being developed internally or brought in from outside. They challenged Philips Design, which supported the company's technology-development groups and businesses, to address this shortcoming. Philips Design has conducted more than 20 projects to explore how emerging technologies could be used to create new products in the consumer electronics, lighting, and health care markets. One result is Ambient Experience for Healthcare. "Ambient Experience has strengthened Philips's €3.27 billion [$4.63 billion] imaging business around the world, allowed it to realize higher prices, and improved its profitability," says Thomas van Elzakker, the general manager for new ventures who heads the operation.

Since the introduction of CT, in the early 1970s, and MRI, in the early 1980s, radiologists have been demanding ever more powerful machines to improve the quality of images and reduce the time and cost of examinations. Consequently, innovation in the imaging industry has focused mainly on technology substitutions: more-sophisticated devices that can capture more data in less time. In the 10 years before AEH was introduced, the number of images that a CT scanner could capture with each rotation of

The Power of Technology Epiphanies

A *technology epiphany* leads to a radical change in the meaning of the experience customers have when they use an offering. Below are two examples.

OLD MEANING

Before the launch of the highly successful Nintendo Wii, the prevailing meaning of the video-game experience was passive immersion in a virtual world. Nintendo realized that by allowing the console to sense the speed and orientation of the controller, a new technology—MEMs accelerators—could turn video games into active physical entertainment in the real world.

NEW MEANING

OLD MEANING

Casio and other watch manufacturers used low-cost quartz technology together with LED and LCD displays to replace mechanical movements and create inexpensive, highly accurate timekeeping devices. But Swatch realized that the new technologies could be used to create highly accurate watches that were also affordable fashion accessories.

NEW MEANING

PHOTOGRAPHY: GETTY IMAGES, GETTY IMAGES, VEER, ASSOCIATED PRESS

Idea in Brief

In conventional product development, companies look for new technologies that will better serve the existing needs of their customers.

But if they want to create breakthrough products, they should seek to understand how those technologies could be used to address needs that customers may not realize they have.

To come up with these *technology epiphanies*, companies should turn to interpreters—experts from far-flung fields with a novel perspective on users—rather than to the users themselves.

the X-ray tube had increased sixteenfold, and the rotation speed had doubled (improving the machine's ability to compensate for patients' movements). Although Philips was at the forefront in improving performance, in 2002 its leaders saw that the company's edge in differentiating its products in this manner was rapidly shrinking. With AEH, Philips found a new way to serve the market.

Anxiety makes it hard for patients to lie still inside scanning devices, but movement affects the quality of the images produced. The usual practice is to sedate anxious patients, especially children, but that increases the risks of the procedure and the time it takes.

AEH creates a more relaxing atmosphere for patients by using several technologies, including LED displays, video animation, RFID (radio-frequency identification) sensors, and sound-control systems. For example, when a child approaches the examination area, she chooses a theme, such as "aquatic" or "nature." She is then given a puppet containing an RFID sensor, which automatically launches theme-related animation, lighting, and audio when she enters the examination room. The theme can also be used to teach the child to stay still during the exam: In the preparation room, a nurse may show a video of a character on the sea and ask the child to hold her breath when the character dives underwater to seize a treasure. Projecting the same sequence during the exam helps the child hold her breath and lie still at the right moment.

This approach has generated significant benefits beyond improving patients' experience. For example, it has cut the time required to conduct CT scans by 15% to 20%; reduced the number of children under the age of three who need to be sedated for a CT scan by 30% to 40%; and slashed the amount of radiation they receive by 25% to 50%.

Meaning First, Technology Second

Technology epiphanies gave rise to AEH: This was the first time anyone had considered that equipment manufacturers, and not just hospitals, could do something to alleviate patients' anxiety—that there might be an alternative to the risky, time-consuming, and costly practice of sedating patients. It was also the first time anyone had seen that patients' level of stress is deeply affected by the environment in which their experience occurs, and that the experience includes not just the scan but also what happens before and after it.

After Philips had these epiphanies, the untapped potential of ambient technologies in health care became apparent. Philips articulated its insights first and then used them as a lens through which to assess the value of the technologies.

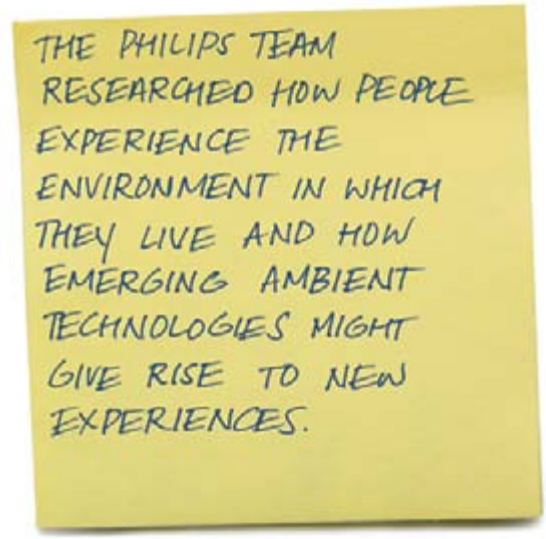
How can your organization produce technology epiphanies? Normally, firms investigate customers' needs by asking them what they want or closely scrutinizing them as they use a product. Although such endeavors are highly effective for improving existing products, they rarely lead to brand-new ones, especially if users are unfamiliar with the

technology in question. Indeed, patients who had to undergo scans were worried about the pain of a sedative injection; they would not have imagined that projecting animations might make the injection unnecessary. And radiologists had never considered how changing the hospital's ambience might improve clinical performance.

For this reason, Philips Design focuses on new visions that technology could make possible and that could become more meaningful to users than existing products. The first step in coming up with those visions is to find interpreters—experts who have studied the same users of your product, in the same context, but from different perspectives. They may be organizational insiders or outsiders—scholars, researchers, designers, or people from other industries or from suppliers of complementary technologies.

Starting in the early 1990s, Stefano Marzano, then the CEO of Philips Design and now the chief design officer at Philips, assembled and nurtured a unique team of young insiders with expertise in interaction design, architecture, interior design, sociology, and anthropology. In the years before the creation of AEH, the team conducted research on how people experience the environment in which they live and how emerging ambient technologies might give rise to new experiences.

One project, called Noah's Ark, explored the overall experience of going to bed, sleeping, and waking up. It led to an experiment involving an interactive system that allowed subjects to project clouds, poems, and other images on their bedroom ceilings to enhance rest, intimacy, imagination, or play.



Another project, called Pogo, whose members included experts in pedagogy and literature from the University of Siena and the University of Liège, explored the potential of media technologies, RFIDs, and video projection to educate children through storytelling. Insights from these projects led the Philips Design team to incorporate video in AEH.

Kenneth Gorfinkle was an important outside interpreter in the AEH project. A clinical psychologist at New York Presbyterian Hospital and Children's Hospital, Gorfinkle is an expert on how pain affects children during treatment. When the Philips Design team visited him at the hospital, he took the members on a tour of its examination areas. Rather than

BELOW LEFT
AEH's "kitten scanner" helps children overcome their fear of the real machine. **RIGHT**
Animated projections in the examination room calm their anxiety.

Technology Epiphanies in Action
Creating Kid-Friendly Medical Environments

PHOTOGRAPHY: COURTESY OF PHILIPS

Finding the Right Interpreters

Users are often helpful in understanding existing meanings but rarely so in envisioning new ones. Companies searching for technology epiphanies should turn to interpreters—experts who study the same users of a product in the same context, but from different perspectives. Interpreters may come from inside or outside your organization. Answering these questions can help you find them.

LOOK AT THE WHOLE USER EXPERIENCE

What is your users' experience before, during, and after your product is engaged with?

SEARCH OUTSIDE YOUR NETWORK

What unusual domains (fields with which your business doesn't normally interact) also concern themselves with your users' whole experience?

FIND THE FORWARD-LOOKING RESEARCHERS

Who are the people in each domain doing research on that experience?

Who among them would your competitors overlook?

Who are the emerging researchers who are exploring new perspectives?

Can your chosen interpreters suggest other interpreters?

focusing on the devices and instruments, he discussed the impact of the hospital environment on children's stress. He told the team about a study in which children interviewed even four years after their exams said that the injection of the sedative had been the most frightening part of the experience.

Sedation typically occurred in a small dedicated space. Gorfinkle suggested that the space be made as relaxing as possible and that the examination end in a different room so that the child's last memory of it would not be associated with the injection.

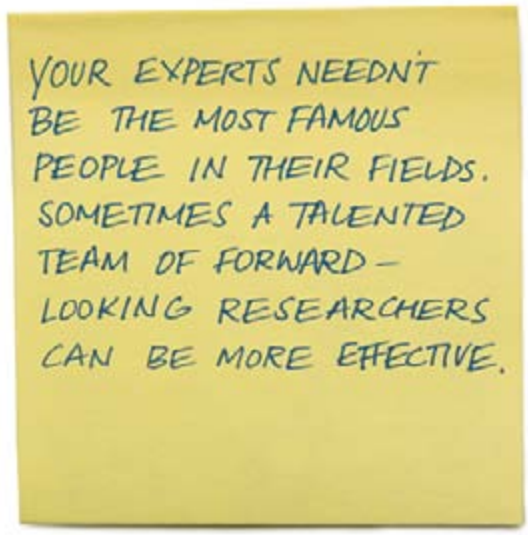
Sachin Behere, a design consultant at Philips Design, was an important internal interpreter. An architect who had studied design and environmental analysis at Cornell University and the Indian Institute of Technology in Mumbai, he had held jobs at architectural and facility-planning companies and, after joining Philips, had worked on hospital projects in the Middle East. He provided significant insights into how the layout of rooms could help to relax patients and staff members and improve workflow efficiency.

The sidebar "Finding the Right Interpreters" offers questions that can help companies find their own Gorfinkles and Beheres. An important step is to identify the fields in which to search. Some of the interpreters involved in the project that led to AEH were the kinds of people one would expect to see in an imaging-devices initiative: doctors, hospital managers, engineers of medical equipment, and marketing experts. Others, however, came from unusual domains: architecture, psychology, contemporary interior design, LED technology and video projection, interaction design (typically used in industries that provide software-based services), and interactive hardware and software.

To identify unusual but appropriate domains, first broaden the scope of your analysis to include the user's whole experience. Instead of focusing solely on what happens to a patient *during* a CT or an MRI, Philips also considered the patient's experience before and after the scan: entering the hospital, finding the right department, waiting, going into the changing room, entering the examination area, returning to the changing room, and arranging the next appointment.

Then look for factors related to that experience that your organization normally wouldn't think about during product development and consult experts on those factors. For Philips's scanners business, the experts included child psychologists, architects who design hospitals, and interior designers of hospital rooms and furniture. Significantly, Philips did not crowdsource. It wanted interpretations, not ideas, and it realized that thousands of interpretations would only create noise. So it carefully searched for a few people who could provide an unusual but solid interpretation of a complex scenario.

To identify such experts, seek out people who have conducted research on users' experiences and have come up with interpretations that challenge the dominant assumptions. Consider Gorfinkle. Through years of study as a clinical professor of psychology, he has developed deep and unique knowledge about how pain affects children. In his book *Soothing Your Child's Pain,* he explains how different techniques—including parents' telling stories—can help children relax. Insights from his studies contributed to the inclusion in AEH of projected animations and a scaled-down version of a CT scanner that children can use in the waiting room to scan the puppets they've been given. This "kitten scanner" both familiarizes children with the machine so that the real



thing will be less frightening and helps them learn the importance of lying still during a scan: They can see that if they shake the toy while scanning it, the image is distorted.

Once an expert has proved helpful, ask him or her to suggest other people or organizations you might recruit. Gorfinkle recommended that Philips approach the Child Life Council, a nonprofit organization that promotes medical procedures to reduce stress and trauma. The council suggested ways in which the hospital environment could facilitate positive interactions among patients, staff members, and relatives.

Your experts needn't be the most famous people in their fields. Sometimes a talented team of young and forward-looking researchers can be more effective. Indeed, eminent experts who are the source of dominant assumptions may be less likely than up-and-comers to challenge those assumptions. In addition, if experts are well known, your competitors are also likely to tap them.

Putting It All Together

An effective technique for eliciting the insights of interpreters is to observe with them as users go through an experience; this allows the interpreters to point out behaviors that neither you nor the users could see and articulate on your own.

Philips conducted workshops it called Future Landscapes, in which a number of interpreters discussed how health care experiences were changing and brainstormed about enabling new experiences through technology; their conclusions were used to redesign the user experience. Toward this end, the team at Philips Design created an "experience flow poster": a detailed map of the various steps in the experience of patients, their relatives, and the clinical staff before, during, and after an examination. Each stage was depicted in three layers: the *people* layer, which described how every step of the experience could be improved, according to the interpreters' insights; the *context* layer, which described how the environment should be redesigned to create a new experience; and the *enablers* layer, which described how ambient technologies or other solutions could achieve the redesign.

Consider the step preceding an examination: The people layer captured the interpreters' idea that fictional stories could be used to explain the coming procedure to a child. This led to a redesign of the experience (captured in the context layer) to include video animation and the kitten scanner. The enablers layer captured the technologies—video projectors, animation applications, RFIDs in puppets—that would enable this new experience.

Finally, Philips built a full-scale prototype of the entire AEH system. Such a prototype allows potential customers, partners, and company insiders to experience the radical shift in a product experience for themselves. Indeed, only after a prototype of AEH was presented at the 2003 annual meeting of the Radiological Society of North America, in Chicago, did customers start to see the system's potential. Their positive reaction helped win support for the project from Philips executives in the health care division who had not been fully onboard.

The first AEH suite opened in 2004 at Advocate Lutheran General Children's Hospital, in Park Ridge, Illinois, a Chicago suburb. Today more than 260 hospitals around the world have suites. And AEH has allowed Philips to expand its health care business into areas that it could not have served as a supplier of scanners. For example, in 2009 an AEH suite that did not include Philips scanning equipment was installed in the emergency department at Florida Hospital for Children.

IN MARKETS where everyone can easily gain access to new technologies, the big winners often are not the companies that obtain them first and use them to enhance existing products. They are the companies that understand how those technologies can be used to create better customer experiences than existing applications do. And the biggest winners will be companies that learn to systematically produce one technology epiphany after another.

HBR Reprint R1110H