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Accelerating product development: The tools you need now

To speed innovation and fend off disruption, R&D organizations at incumbent companies can borrow the tools and techniques that digital natives use to get ahead.

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Between rising customer expectations and unpredictable moves by digital attackers, R&D organizations at incumbent companies are under intense pressure. They're being asked not only to push out innovative products and services—which is key to ramping up organic growth—but also to support the formation of digital business models that compete in new markets. Yet many R&D teams, particularly at companies that make industrial products, find themselves hampered by longstanding aspects of their approach, such as rigidly sequenced processes, strict divisions of responsibility among functions like engineering and marketing, or a narrow focus on internal innovation.

Some product-development teams have begun to overhaul the way they work as part of wider digital transformations at their companies. Those transformations can take a long time, though, as companies modernize their IT architectures, adopt new technologies, reorganize people, and learn agile ways of working. Since digital rivals aren't waiting, product developers at

incumbent companies need innovation accelerators that they can put to use almost immediately. But with a wide range of technologies and methods to choose from, where should they start?

In our experience helping incumbents update their R&D practices, four solutions stand out for their substantial benefits, as well as for their ease of integration with existing activities. With so-called digital twins of in-use products, R&D organizations can make sense of product data across the entire life cycle, thereby reaching new insights more quickly. Once incumbents identify promising concepts, they can shorten the product-development cycle by staging virtual reality (VR) hackathons. Some will need a jolt of inspiration to speed up the R&D process. In that case, they can try holding "pitch nights" to collect and sift through ideas from outside the company, or setting up in-house design studios, or "innovation garages," to stimulate internal collaboration. Here, we explain how established companies are using these approaches, either singly or in various combinations, to develop winning products rapidly against threats posed by digital challengers.

USING FULL LIFE-CYCLE DATA TO DRIVE INNOVATION IN REAL TIME: DIGITAL TWINS

To track customer experiences and product performance closely, many digital natives have developed sophisticated mechanisms for gathering data about items they have sold. These companies then analyze these data and use their findings to guide the development of new products, as well as software updates that correct flaws in existing products or add features to them. The potential applications, however, are moving beyond digital natives alone. Sensors embedded in mechanical equipment, for instance, can reveal more than companies have ever known about how well their machines work in the actual world. And all manner of digitally equipped products, from smartphones to farm equipment, can now be monitored and maintained using Internet-of-Things (IoT) applications.

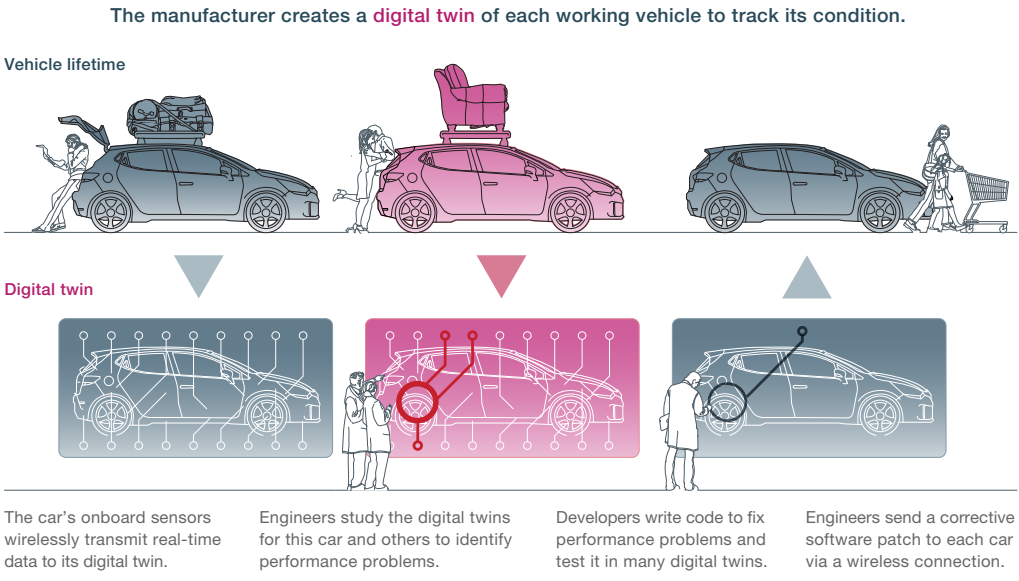
Yet traditional incumbents often encounter complications when it comes to gleaning and acting on insights from the data generated by in-use products. Companies issue many different versions of their products—for example, models tailored to requirements that vary across geographies. The challenge that arises is keeping track of all these versions. And when companies need to issue software updates for their products, they find it difficult to first ensure that each update will work on every version of a product.

Some incumbents have started to address these limitations by employing "digital twins," which are virtual counterparts of physical products. By closely syncing existing product information (such as the exact software and hardware configuration and performance parameters) with real-world data on the usage and performance of an actual product throughout its life cycle, companies can precisely monitor problems and discover customers' unmet needs. Such insights can point companies toward breakthroughs in the design of new products, as well as significant reductions in the time and expense associated with such activities as performing maintenance, recalling products, complying with regulatory requirements, and retooling manufacturing processes. And before incumbents push out software patches remotely, they can test fixes and new functions on digital twins (Exhibit 1).

One automotive OEM struggled to provide effective maintenance services as the variety, complexity, and geographic footprint of its product lineup increased. Yet it also knew that the data emitted by its products would say a lot about how they perform and what support they require. The company chose to build a new, more flexible data architecture that would pour live product data into an array of digital twins. Based on what the company

Exhibit 1

One automotive company uses 'digital twins' to accelerate the development of new product features and performance boosters.



learned from the digital twins, it identified a range of services to boost customer satisfaction and, ultimately, sales. These included remotely delivered software updates and digital tools for customer engagement. By sending new software out "over the air," for example, the company was able to replace the 500 or so different versions of a single model's core operating system with one new version—a shift that greatly streamlined the development of subsequent updates. All told, the company thinks that these improvements could increase its earnings before interest and taxes by up to five percentage points.

SHORTENING THE CONCEPT-TO-PRODUCT TIME FRAME: HACKING IN VIRTUAL REALITY

Emerging evidence suggests that in the digital economy, which favors first movers and fast followers, issuing a well-developed product too late is more costly than being first to market with a good product that still has some rough edges. The latter approach borrows from the hacking methods of software developers, who release beta versions of new products to get early reactions from customers, define customers' preferences through A/B testing, and then deliver on their feedback with changes made in brief, frequent cycles. As long as companies are quick to turn around each new version of a product, various styles of hacking can benefit incumbents, not just those that sell software and services.

Visualization technologies like VR, augmented reality (AR), and 3-D printing can bring still greater improvements in the rate and flexibility of R&D efforts. Whereas designers might spend five or six weeks assembling a physical prototype, they can build a VR prototype in a matter of days. With the right tools in place, cross-functional teams can alter those prototypes even more quickly and estimate in real time the cost implications of potential design improvements. In our experience, the effective use of VR can reduce R&D costs and time to market significantly—as much as 10 to 15 percent for each measure—while achieving gains in product performance (Exhibit 2).

VR technology helped one advanced-equipment manufacturer to make a breakthrough with its next-generation model of a large stationary electronic device. Competitors had been nibbling away at the company's market share for years because their versions of the device were less expensive and easier to install. But the company couldn't figure out what made its competitors' designs superior. Gathering information from a range of sources, the company created 3-D models of competitors' products. Its engineers could then closely examine those models from every angle with VR headsets. Their

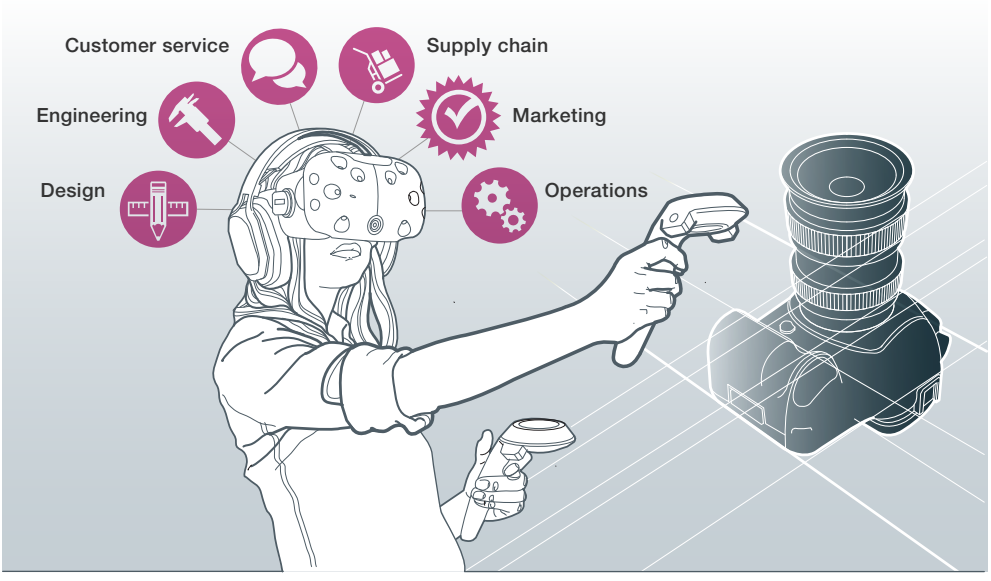
Exhibit 2

What is a virtual-reality hackathon?

Virtual-reality hackathons help companies **reduce R&D costs and time to market by bringing cross-functional teams together** to refine virtual prototypes in real time.

Faster and more effective R&D

Application area	Typical impact
Time to market	15% reduction
Value proposition	20% increase
Development cost	15% reduction



research convinced the R&D team to revisit certain assumptions about how its next model of the device should be designed.

With those outdated assumptions in mind, the company held a series of hackathons to develop the new version, bringing people from various departments together in the same room, either physically or virtually, to push a VR prototype through multiple cycles of review and adjustment. It placed its own prototype and competing models in the VR environment to make direct comparisons that would have been impractical in the physical world. The cross-functional team then adjusted the prototype on the fly as improvements were suggested. Not only did the VR technology speed up the design process, but inviting all the relevant departments to hack the virtual prototype at the same time made it possible to solve problems quickly and build new capabilities, such as working in an agile manner.

PLUGGING IN TO AN INNOVATION ECOSYSTEM: THE PITCH NIGHT

Digital twins and VR hackathons can readily help traditional companies make rapid improvements to existing products. Many companies have a different ambition—expanding their range of offerings—but lack the in-house capabilities to conceive and develop product ideas. Some need an infusion of fresh, entrepreneurial thinking. A business in either situation can benefit from hosting a "pitch night," in which it invites start-ups to consider an R&D challenge and derive solutions from their innovations.

For a tier-one industrial supplier, a pitch night led to the creation of an advanced-analytics engine used to improve the design of industrial transmissions. The supplier began the pitch-night process by issuing four use cases to a wide range of start-ups and calling for them to outline potential solutions. It chose 100 or so intriguing responses and brought in those start-ups to make four-minute presentations to a jury of the company's CEO, chief digital officer, selected board members, and business-unit heads. In the contest related to smart industrial transmissions, the jury identified an especially promising solution from a small group of data scientists who had been spun out of a university. That team was given a commission to spend eight weeks creating a minimum viable product (MVP). The MVP worked well enough that the company calculated that it would have a payback period of just three months and could be scaled into product improvements worth some €500 million in annual revenue.

The analytics engine wasn't the only useful outcome of the pitch night. Its product-development specialists have kept up with the start-ups that first responded to the challenge, thereby forming an innovation network that the company continues to rely on. One of those start-ups went on to contribute ideas for a different product, which led to a joint prototyping effort. So convinced is the company of the pitch night's usefulness that it has held more pitch nights for start-ups as well as for employees, suppliers, and academic institutions. It has also set up a dedicated global network of "innovation hubs" in Asia, Europe, and the United States to form deeper connections with local innovators and source ideas and opportunities for collaboration.

PUTTING CREATORS IN THE SAME ROOM: THE INNOVATION GARAGE

As pitch nights show, innovation in the digital age frequently springs from creative collaboration, whether in formal settings or chance encounters. This is one reason why start-ups are the sources of so many inventive products: their small head counts make it easy for every employee to stay informed about customer needs and participate in creative endeavors. Many of the R&D efforts we see at large incumbents, however, are conducted in a

gated, multistage process, where one department completes a task before handing things over to another. That can give rise to divergent points of view about what customers want, resulting in tasks that need to be redone or products that miss the mark.

To break down the silos that stymie rapid innovation, we see companies setting up cross-functional R&D teams. One form of such a team is the "innovation garage," a self-contained group responsible for quickly generating new ideas with minimal overhead (Exhibit 3). An innovation garage is distinguished by two essential features. First, it must include

Exhibit 3

An **'innovation garage'** provides space for a self-contained group to generate new ideas quickly and with minimal overhead.

members of every function that typically participates in R&D: engineering, data science, marketing and sales, finance, and operations, to name a few. These professionals are joined by expert practitioners of agile ways of working: a product owner, who decides what new products will consist of, and a scrum master, who orchestrates the iterative, test-and-learn development process.

Second, executives must make clear that the garage isn't a showroom, but a space for meaningful work, performed according to the new rules of digital competition. One European company housed its innovation garage just outside the head office. The garage stood as a living symbol of the company's commitment to innovation. Those assigned to the garage were expected to produce no fewer results than their colleagues working in the conventional building just outside. Moreover, the garage was given special permission to circumvent bureaucratic processes, such as hiring and technology integration, so that it would not lose time while waiting for approvals. The team's dedication has borne fruit: one of the first products to come out of the garage opened an entirely new sales channel, backed up by efficient, all-digital business operations.

In our experience, incumbents can get innovation garages up and running in a compressed time frame of about six months: several weeks of up-front planning, followed by a longer effort, usually lasting three or four months, to build and staff the new space, assign one or two initial projects, and allow the garage team to get started. By the end of that build-out period, the team should have created its first set of MVPs for testing, in a demonstration of the pace required to keep up with digital-native competitors. Then the product owner can work with strategists and digital leaders in the core business to fast-track design projects that correspond to company goals such as expanding product ranges or entering new markets. Often, that means developing a mechanism for sourcing ideas and assessing their viability, including potential commercial models and risks to the core business.

One multinational company in the automotive industry set up an innovation garage to break out of its familiar pattern of basing new products on requests from existing customers. This approach meant that product-development activities invariably yielded extensions of the stand-alone technical offerings that had been the mainstay of the business for over a century. Unconventional product ideas had to be placed on a back burner because

they didn't fit into the company's business model or would have required capabilities that the company lacked.

In the innovation garage, however, these ideas could be quickly realized and tested at a comfortable remove from the core business. As the garage comes up with prototypes of new products and services, the company showcases them at international exhibitions, where customers can respond. Exhibiting prototypes to the public has also helped the company to gain standing as an innovator, which has attracted digital talent and led other companies to propose ways of combining their respective offerings.

CHOOSING THE RIGHT METHOD

While all of these approaches have been shown to speed innovation at traditional companies, each naturally suits certain situations better than others (see sidebar, "Four product-development accelerators: When to use them and what you need"). For companies with robust pipelines of innovative ideas and slow or outdated product-development processes, digital twins and VR hackathons can serve as potent accelerators—provided that companies are willing to invest in new technical capabilities. Digital twins, in particular, require modern data architectures along with sophisticated IoT systems that let companies capture data from and push updates to products that are in the field. VR hackathons impose fewer technological demands, but they also work best when companies already have experience developing products in a cross-functional and collaborative manner.

For companies that need new ideas, other approaches may be in order. Pitch nights are a more conventional solution in certain respects: it's common for large companies to co-opt ideas from smaller enterprises with a higher tolerance for risk. The pitch night serves incumbents best when they treat it as the start of a long-term program of participating in innovation ecosystems, rather than a one-off endeavor. The innovation garage is a good alternative for incumbents that are struggling to penetrate new markets or even to conceive products that might appeal to nontraditional customers. Garages work best when companies give free rein to the garage team by relieving the team from operating requirements and strategic assumptions that might otherwise constrain it.

Four product-development accelerators: When to use them and what you need

Digital twins	**Your goal:** Gain real-time insights to drive product development; enhance existing products with frequent updates **Key enablers** • Advanced analytical and data-science capabilities • Digital data architecture • Internet-of-Things connectivity and ability to deliver software updates remotely
Virtual-reality hackathon	**Your goal:** Optimize product design and delivery across every stage of the product life cycle **Key enablers** • Early-stage concept battles to generate a strong pipeline of ideas • 3-D design/engineering talent and tools • Tools and data that guide decisions during the hackathon • Cross-functional product-development experience
Pitch night	**Your goal:** Expand range of offerings to existing or new customers, along with internal design and technical expertise; initiate and sustain participation in wider innovation ecosystem **Key enablers** • A reliable flow of well-defined product or market opportunities • A manager or department responsible for sustaining relationships with innovation partners • Funding to develop and commercialize new offerings in partnership with outside entities
Innovation garage	**Your goal:** Penetrate new, sometimes adjacent markets; develop suites of digital products and services **Key enablers** • Willingness to let the garage operate according to agile principles and take shortcuts around internal restrictions • Reliable mechanism for sourcing and filtering product ideas from within • Funding for speculative ventures and market-entry programs

The innovation and speed to market demonstrated by digitally enabled companies have exposed shortcomings in the R&D practices of more conventional businesses. Now incumbents can counter their digital challengers, and even outmaneuver them, by exploiting advanced capabilities such as the four we have discussed in this article. Those that do will achieve the pace of innovation that is required to compete and win in the digital economy. Q

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