From fitness trackers to smartwatches, wearables have made a splash in the consumer market, but few enterprises are ready to dive in and deploy the new technology. Nonetheless, most CIOs say wearables are destined for the workplace.
Wearables go to work

From fitness trackers to smartwatches, wearables have made a splash in the consumer market, but few enterprises are using the new technology. Nonetheless, most CIOs say wearables are destined for the workplace.

BY STEPHANIE OVERBY
Why there’s no waiting for wearables

When evaluating wearable technology, perception is everything. For consumers, the cool factor rules. But enterprises have their sights set on hands-free business efficiency.

On the consumer side, fitness trackers and smartwatches are selling fast (IDC reports that 21 million devices shipped in the third quarter of 2015, for a year-over-year increase of nearly 200 percent). On the enterprise side, however, adoption has been much slower, as CIOs search for the business value of this promising technology. In a Robert Half Technology survey, 81 percent of the 2,400 CIOs polled said that they think wearable computing devices will eventually become common workplace tools, but only 20 percent said that will happen within the next year or two.

Of course, some forward-thinking companies are deploying wearables, and one current example is the use of head-mounted displays to enable hands-free work and remote collaboration.

Last month, Gartner predicted that head-mounted displays will begin progressing toward mainstream adoption for both consumers and businesses this year. The research firm expects 1.43 million such devices to ship in 2016, with that number jumping to 6.31 million in 2017. The enterprise will play a significant role in head-mounted display sales next year, and by 2018, 26 percent of head-mounted displays will be designed for business use, Gartner says.

Stats like those reinforce the argument that wearables have a promising future in the workplace. And as Stephanie Overby reports in this month’s cover story, “Wearables Go to Work” (page 9), the technology is starting to fulfill its potential at large enterprises such as Lockheed Martin, Humana, the Electric Power Research Institute and Duke Energy.

One thing that sets the business world apart from the consumer world when it comes to wearables, however, is the cool factor. As Brent Blum, a pioneer in wearable products who now leads Accenture’s wearable technology practice, tells Overby, “For consumers, a wearable has to look good, be extremely easy to use, and integrate with their lifestyle.” In the enterprise, Blum says, you have to create a clear business case for the technology. Cool doesn’t count.

Beyond the tech and business angles

Once you create that business case, wearables may present other challenges, and Kristen Lamoreaux (page 12) looks at one of them: Will we need to develop new rules of etiquette when we all start wearing fitness trackers and smartwatches at work?

Like so many new technologies, wearables present new territory for us to navigate. But wearables in the workplace are closer than you think. And that’s pretty cool.

– Dan Muse, editor in chief, CIO.com
It’s time to lean in on IT hiring

How are you feeling about your IT budget over the next 12 months?

I ask because we have an Economic Outlook research study at CIO that we update on a quarterly basis and, since November of 2012, between 51 percent and 57 percent of respondents have said that their budgets would rise over the next 12 months. This quarter, however, just 35 percent of the more than 300 IT executives polled said that their budgets would increase in the next 12 months. The good news here is that the number of respondents saying that their budgets would decrease remained the same. So after three and a half years of increasing budgets, we are now seeing budgets primarily holding steady.

This doesn’t come as a complete surprise, with many trusted sources — including our sister company IDC, as well as Gartner and The Wall Street Journal, among others — reporting over the past couple of months that they’re seeing a global slowdown in enterprise IT spending. The myriad reasons for this include economic unrest in emerging markets (perhaps most notably China), a leveling-off of mobile phone shipments and the upcoming U.S. presidential election, among other things.

In addition to the tech spending slowdown, the IT labor market is in a slump. There has been a sharp decline in U.S. IT hiring this month, according to consulting firm Janco Associates. And tech jobs website Woo.io is reporting a decline in average IT salaries. The job market data is of more concern to me than the IT spending numbers, since many CIOs at large enterprises in various industries are telling me they can’t hire talent fast enough. Developers, data specialists, security specialists and business relationship managers are just some of the IT professionals who are in high demand, I’m told.

It’s one thing to hold the line on spending for a while, maybe until November’s election or through the end of a fiscal year. It’s another thing not to hire talented IT professionals to help you achieve corporate goals, get closer to customers and drive innovation and growth.

I’d like to hear your thoughts on these numbers and reports. Do they reflect what’s happening in your organization? Where does technology rank against other spending priorities? Is IT on par with sales, marketing and other departments in terms of what gets funding? Or is it one of the first to be asked to make sacrifices when the waters get a little rough?

As the publisher of CIO, I’m admittedly biased, but I think leaning into technology — and investing in the talented people behind it — can make you stronger in the long run.

Please drop me a note and let me know your thoughts on these topics.

– Adam Dennison, SVP and publisher, CIO.com (adennison@idgenterprise.com)
Who’s in charge of AI?

As artificial intelligence continues to make inroads into the workplace, the managerial reporting lines can get murky.

BY JOHN DODGE

Artificial intelligence is starting to disrupt the workplace as applications powered by machine learning algorithms begin to permeate enterprises at every level.

But who’s doing that disrupting — and to whom do they report? Data scientists, business architects and quantitative analysts (also known as quants) are most often the professionals exploiting the burgeoning technology — sometimes under the mantle of the IT department, but often not.

“Unfortunately, IT budgets have been getting decreased, so IT doesn’t have the resources to take on these new responsibilities,” says Dave Schubmehl, an analyst at research firm IDC. “What we’re seeing is that lines of business are taking up machine learning directly and looking to outside vendors to implement it quickly.”

These early movers aren’t alone in taking up AI. By 2018, artificial intelligence will be incorporated into about half of all applications developed, according to IDC, and by 2020, savings made possible by AI-enabled efficiencies are expected to amount to an estimated $60 billion for U.S. enterprises. How will enterprises organize them-
selves to reap the rewards of artificial intelligence? Here’s a look at how AI gets done at two large enterprises — Pitney Bowes and General Electric — and how it might get done at CIT Group, which is exploring its AI options but has yet to jump in.

**IT-engineering synergy**

At Pitney Bowes, the AI algorithms that drive the company’s logistics business are developed by 1,200 data scientists, mechanical and electrical engineers, software developers and design professionals, many of whom are trained as “black belts in data analytics,” says executive vice president and chief innovation officer Roger Pilc.

The group includes people with development skills and domain knowledge, and it’s spread across three continents, but everyone reports up to Pilc. Pitney Bowes is an early adopter of GE’s Predix industrial operating system, which uses AI technology to collect and manage huge volumes of data, and IBM’s Bluemix platform for developing and hosting applications in the cloud.

Pitney Bowes engineers creating algorithms work closely with IT, which is responsible for the company’s digital infrastructure. There have been 30 billion calls to the company’s logistics machine-learning algorithms since Pitney Bowes started using machine learning three to four years ago.

“A big part of the competence [relies] on top data engineering talent. Central IT and engineering working together is really critical,” says Art Parkos, vice president of strategic technology at Pitney Bowes.

**GE’s digital transformation**

In September, General Electric, which has embraced AI, consolidated several software development units into GE Digital, whose staff includes 1,200 “software experts.” A complementary organization called the GE Store for Technology employs the 3,600 research scientists and engineers who “drive” GE’s industrial businesses.

GE Digital provides the software expertise while the GE Store is steeped in domain knowledge and is charged with making sure innovations are quickly deployed within GE’s individual businesses.

“If we have something in [GE Power] that might apply to that business, we will quickly make that connection,” says Colin Par ris, vice president of software research. “The GE Store is the central hub from which [technology and innovation] flow.”

**‘Data geeks’ experiment**

At CIT Group, a leasing, lending and banking concern, a few “data geeks” are experimenting with AI, but the company has not yet funded any AI projects, although chief data officer B.J. Fesq says that could change in a year or two, after CIT digests the acquisition of OneWest Bank.

“AI could be applied in many parts of the organization, so it might not be overseen by one group,” Fesq says. “If it was, I imagine that sort of an enterprise data and analytics group would fit best to drive synergies and enforce best practices.” He is also evaluating AI products from outside vendors, including easy-to-use tools that could help democratize the discipline.

John Dodge is a Boston-based writer.
Containers are all the rage among developers, but the technology, offered by companies such as Docker and CoreOS, doesn’t seem to be on the radar of most CIOs at large enterprises. However, experts say that will change as more enterprises move to the cloud and refashion their IT departments under agile and DevOps principles. Virtualization made computing more efficient by making it possible to run multiple operating systems on a single server. Containers further improve server resource utilization by allowing developers to run apps in their own containers, and run multiple containers on one operating system. Developers can also move containers between Linux servers or virtual machines (VM) and make changes to apps without breaking the software.

"Docker and containers are a great catalyst” for creating and testing apps for cloud-based systems, said Docker CEO Ben Golub in a presentation to more than 80 CIOs at a Wall Street Journal event in February.

CIOs question container value
Golub kept his comments at a high level, but it was clear that many of the CIOs were unfamiliar with container technology. In a live

CIOs aren’t ready for container technology

In one survey, less than half of the CIOs polled said their companies are using containers. Why aren’t more IT leaders embracing Docker and CoreOS?

BY CLINT BOULTON
audience poll conducted during the event, only 44 percent of the CIOs said that they were using container software. Golub joked that the remaining 56 percent are running containers but don’t know it.

But the CIOs, who submitted questions and comments anonymously via tablets, expressed skepticism: “I’m not seeing the value proposition here — it seems like there are other technologies that do this. Good engineering and architecture should eliminate this,” said one. Others asked how containers were different from Red Hat’s OpenShift, a platform-as-a-service (PaaS) technology, or configuration management tools such as Puppet and Chef. One went so far as to ask, “What would businesses lose if Docker or its competitors disappear?”

The comments indicated that some CIOs believe that VMs running in private or hybrid clouds are sufficient. But experts say that containers offer a more robust alternative than VMs for supporting the continuous delivery and continuous integration attributes of DevOps practices.

Ralph Loura, who used containers when he was CIO of HP’s Enterprise Group, says that CIOs who don’t see value in containers are likely still deploying VMs simply as corollaries to physical machines. Chances are, they haven’t embraced continuous integration and continuous delivery.

“The benefits of the container are going to be lost on them because they haven’t changed their model,” he says.

**Why aren’t CIOs there yet?**

Loura says that many CIOs are juggling legacy systems and newer technologies. Many are also struggling to adopt agile development. For them, DevOps remains elusive.

“Every CIO in that room, I bet, has seen an explosion in the demands on the Web and digital side, and the way that they run their business is not set up to do that,” said CoreOS CEO Alex Polvi. CoreOS uses containers, security tools and other technologies to assist companies with the transition to the cloud. Polvi calls this strategy “Google infrastructure for everyone else,” or GIFEE. The description is apt. Google and Facebook have deployed millions of containers on low-cost commodity hardware. Startups such as Docker and CoreOS took the open-source code underlying container technology and democratized it. Now containers are being deployed en masse at banks like Goldman Sachs, retailers such as Gilt Groupe and technology giants like HP, CA and Verizon.

But these organizations are outliers. Container technologies are the latest in a long line of open-source software, virtualization and DevOps tools that developers use before getting buy-in from CIOs.

“Part of the hesitation around Docker is trying to understand the risk profile,” says Redmonk analyst Fintan Ryan. As a result, many CIOs still look at containers as primarily a test and development environment. But production workloads will migrate to containers in due time, he predicts.

Loura agrees. “Eventually, they’ll be comfortable with managing containers at scale,” he says, but adds that he thinks containers are at least five years away from broad adoption. ■

Clint Boulton is a senior writer at CIO.com.
From fitness trackers to smartwatches, wearables have made a splash in the consumer market, but few enterprises are using the new technology. Nonetheless, most CIOs say wearables are destined for the workplace.

BY STEPHANIE OVERBY
In 2014, Aleksander Vukojevic joined Duke Energy’s emerging technology office, where he evaluates new tools that have the potential to be deployed in the enterprise within three to five years. The technologies he has vetted range from predictive analytics to drones. But there’s one that everybody asks him about — wearables. “Everyone thinks they’re cool. Everyone wants to try them. And everyone wants to know what else they can do,” says Vukojevic.

Over the past year and a half, interest in wearables has intensified — as has the development of wearable options. “When I started, there were just a few players,” says Vukojevic, a former power systems engineer. “Things have changed so rapidly, it’s hard to keep up with everything new that’s coming out.”

Nonetheless, “everyone thinks they’re cool” isn’t a good enterprise business case.

From fitness trackers to smartwatches, wearable computing has made a splash with consumers. But most enterprises have yet to venture into the market. PwC found that just 3 percent of companies were investing in wearable technology in 2015—down from 6 percent in 2014. “Limited success stories and the risk of failed or ineffective implementations are causing CIOs to proceed with cautious and careful optimism,” says Mark Benson, CTO of Exosite, which develops software to help companies visualize Internet of Things data.

The vast majority of CIOs — 81 percent — believe that wearables will enter the workplace eventually, according to a Robert Half Technology survey of 2,400 IT leaders. Of those polled, 37 percent said they expect implementation in the next three to five years while 24 percent said the arrival of wearables at work is five or more years away.

“Enterprises are still in the very early stages of understanding how and why implementing wearable technology across their workforces could be useful,” says Jim Tate, vice president of client services at IT services company Vitalyst.

“There is definite interest in — and potential for — utilizing wearables to help employees accomplish tasks faster, capture better enterprise data, and make important information readily available. But there’s still a lot of work to be done to understand what this would look like, how it would work and, ultimately, how enterprises could realize a return on investment.”

Forward-thinking IT and business leaders, however, aren’t waiting. They’re helping to shape the wearable computing future and are beginning to demonstrate clear, and potentially significant, value for their businesses. They’re using technologies like head-mounted displays (to enable hands-free work and remote collaboration), fitness trackers (for use in wellness programs that lower employee healthcare costs) and systems that deliver more instinctive training and decision support.

Building a business case
Brent Blum has been on the front lines of the wearable computing revolution since the start. In 2006, he developed a portal at Accenture...
Technology Labs that aggregated health data from LifeShirts, smart garments designed to monitor medical patients’ vital signs. He created Verizon Wireless’s first wearable health device and portal, led the development of a medical Google Glass proof of concept for Philips NV, and co-authored a patent on augmented reality safety glasses.

“Technology Labs that aggregated health data from LifeShirts, smart garments designed to monitor medical patients’ vital signs. He created Verizon Wireless's first wearable health device and portal, led the development of a medical Google Glass proof of concept for Philips NV, and co-authored a patent on augmented reality safety glasses.”

Wearables excel at enabling hands-free work and providing advanced context for the things people do, says Blum, who sees the most interest among companies in the aerospace and defense, oil and gas, manufacturing, and logistics sectors. “In the beginning, some leaders were willing to take a leap of faith that wearables would improve the business,” Blum says. “But now they want to see the data. They want to know how much time and money it will save. And that’s difficult to answer.”

“Solutions are emerging slowly but are largely untested at broad scale,” says Exosite’s Benson. “Wearables in the enterprise today are finding most traction where there are safety and operational efficiency benefits — using head-mounted displays for asset integrity management, for example — as is prevalent in process industries. In these industries, the risk of downtime due to failed components is high, the sensitivity to employee safety and security runs deep, and the resulting potential benefits are significant.”

At Lockheed Martin Space Systems, wearables fit into a larger strategy to digitize the product life cycle, from concept to maintenance. “Because we are moving away from paper drawings into a digital environment, wearables are a welcome tool that can help our employees better interact with products and each other,” says Shelley Peterson, wearables lead in Lockheed Martin’s systems engineering group. “For select use cases, wearable technologies offer new capabilities to streamline the human-to-computer interface, increasing productivity and safety while accelerating timelines.” In manufacturing, for example, by superimposing instructions and schematics directly into a real-world work environment, wearables eliminate the need to stop what you’re doing to read drawings and instructions. “The ability to accelerate the timeline and mitigate risk is valuable, especially when working with high-value equipment,” Peterson says.

The "cool" factor with emerging technologies fades fast, says Duke Energy’s Vukojevic. “You have to find a use case that will give you the most benefit right away.” Vukojevic began with the most obvious benefit he could imagine as a former substation test engineer for the $23.5 billion company: using smartglasses to deliver live video and audio from the field to the
systems operations office. “When I was out in the field, I’d encounter things I’d never seen before,” he recalls. With smartglasses, an engineer can share video and audio with colleagues in real time instead of having to call someone to explain what he’s seeing.

The power of collaboration

John Simmins, a technical executive at the Electric Power Research Institute (EPRI), is looking for similar opportunities on a wider scale. He’s working with EPRI’s members to research and develop use cases for wearables in the power industry.

Simmins used to manage engineering and operations software for a utility company, where he introduced a mobile platform that used ruggedized laptops. But he felt the implementation was less than ideal, so he promised himself that one day he’d solve all the problems he saw. “Wearables are the ultimate solution,” he says. “You don’t even have to use your hands to interact with the electric grid or your co-workers.”

Simmins and his collaborators — which include EPRI members as well as universities, startups, and federal labs — have worked with XOEye, Google Glass, GoPro cameras, Daqri’s Smart Helmet, and a handful of skunk works projects built on the Raspberry Pi platform. “If everyone chips in $100,000, suddenly we’ve got a million dollars in research,” Simmins says. “What’s more, we get multiple points of view from groups of like-minded individuals, which is really powerful.”

The research has yielded a few systems to handle very specific tasks, such as inspecting transmission towers and maintaining distribution grids. “It’s not exactly ubiquitous yet,” says Simmins.

One problem with wearables is that they aren’t yet comfortable enough for people to wear all the time. Also, “being outside or in a

WEARABLES

ETIQUETTE IN THE WORKPLACE

Why you need to practice old-school manners for new-school tech. BY KRISTEN LAMOREAUX

HE DAYS OF LEAVING your phone in your car when heading into a job interview or making a big show of turning your phone off in front of your colleagues at the start of a meeting may come to an end when your phone is also your watch.

Will etiquette rules need to be adjusted once we all start using wearable technologies? Maybe not — maybe we just have to remember to follow the old rules. After all, even the current generation of mobile devices is causing many of us to forget our manners.

“As technology continues to advance, it will be embedded in everything — unleashing a constant barrage of data from our watches, shoes, jackets and glasses,” says Leif Maiorini, global technology services director at Cushman & Wakefield. As wearables become more common, he adds, we can use the tools to make the most of our time or we can allow the beeps, taps and alerts to distract us from being in the moment and cause us to squander the very resource — time — that we seek to optimize.

Given the way people multitask (or fail to multitask) today, the latter scenario may be more likely, he adds. “How many times have you been in a meeting ‘multitasking,’ only to request that a direct question be repeated after a period of awkward silence?” he asks.

Helane Stein, CIO at Brixmor Property Group agrees. “I’m old school when it comes to being present and listening during a meeting or conversation,” she says. “As much as I like and use technology, knowing when to put it away is important.”
high-magnetic field can cause issues,” says Simmins. “Every industry has very specific requirements. But wearables are currently one-size-fits-all.”

And that actually means that now is the ideal time for enterprises to get involved. “[W]e have the opportunity to be at the forefront of the development of these technologies and influence the form factors, methods of communication, standards and augmented reality effects that they use,” Simmins says. “That’s better than getting a product later on that isn’t suitable to your needs.”

At Lockheed Martin, the focus is on tailoring wearable devices to meet very specific security and IT requirements. “Working with technology partners now is an opportunity to further shape the technology to address needs specific to our environments,” says Yvonne Hodge, CIO of Lockheed Martin Space Systems, “and we have found that technology partners are very interested in and responsive to our feedback.”

**Calculating risks**

When Christian Pezzin was interviewing for the new chief digital officer position at OCME in 2014, he pitched a plan that involved using wearables to improve customer service. The Italian company builds equipment for packing, filling and handling containers in the beverage, consumer goods and petrochemicals sectors. If you’re drinking a bottle of something right now, it may have passed through one of OCME’s machines.

The day after he joined OCME, Pezzin started researching his idea, buying smartglasses for his team and some customers. He settled on the Pristine EyeSight Enterprise video communications tool, which works with Vuzix M100 and Google Glass. “The advantages of the solution are clear,” he explains. When wearing

The old admonishment to “do as I say, not as I do” won’t work when it comes to wearable tech etiquette. As a leader, you need to set the proper tone for the group and then stick to it. “In a collaborative environment, it’s important to set the ground rules for all participants, be fully present, listen, and pay attention to both the verbal communication and the visual cues,” Stein says.

Old-school manners don’t mean new-school tech isn’t permitted. There will always be times when you’ll be expecting an important call during a meeting. In those instances, just be polite and let your colleagues know. “If there’s a pressing matter and I’m waiting for an email or a call, I warn the person in advance that I may have to interrupt our meeting,” Stein says.

Wearables can also create awkward situations in other ways. For example, what do you do when your fitness tracker announces that you’ve been sitting too long — while you’re meeting with your CEO? One answer may be to change our idea of what constitutes a meeting. Stein routinely invites colleagues to go for walks to brainstorm ideas. “Several of us walk together and have been able to solve complex tasks with creative solutions, while at the same time getting a little exercise,” she says. “However, I make sure walking is not perceived as a mandate. I only do this with those who enjoy it.”

“When we choose to spend our time with someone, or they decide to give their time to us, we should treat that gift with respect and gratitude,” says Maiorini. “Getting an alert on your watch reminding you to be on time for a meeting while you’re answering email demonstrates an appreciation and respect for that individual’s time. Getting an alert on your watch while you’re speaking to someone and then getting distracted – or, worse, responding – sends the opposite message.”

Relationships are built on trust. We build trust when we listen. We can listen only when we are quiet. Quiet your devices.

Kristen Lamoreaux is president and CEO of Lamoreaux Search.
the glasses, OCME field technicians can get instant support when servicing clients. Or if customers don the glasses themselves, OCME personnel can solve their problems remotely.

Smartglasses aren’t new, but their business applications are. “Many factors might affect the usability of this consumer gadget when you’re dealing with an enterprise-grade environment,” says Pezzin. “There aren’t that many companies thinking about enterprise scale usage. So the risks are everywhere.”

One of the biggest issues is connectivity. OCME’s customers may literally be in the middle of nowhere, without so much as a 3G signal. Even a mobile router requires a network, and a customer may not want to open up its wireless connection to external devices. Noise has been another problem. Bottling plants aren’t quiet places. Sometimes you can hear what the wearable device user is saying, sometimes you can’t. OCME is working with the vendor to test new Bluetooth earphone options. “Whenever you take a consumer technology and bring it to an enterprise environment, you’re going to run into surprises,” Pezzin says. “We’re always in pilot mode with our antennas up. We know we’re going into something very, very new that in a year’s time could look totally different than it does today.”

Security is a key consideration at Lockheed Martin Space Systems. The lack of international standards for wearable operating systems, security technologies and networks has thus far resulted in a lack of consistent updates for adding functionality and patching security holes, says Hodge.

Asset tracking is another challenge when it comes to securely integrating wearables into the enterprise. “As devices attach themselves to their users, they can literally walk out the door if employees forget to take them off,” says Hodge. To prevent that, Lockheed has taken a layered security approach, using beacon technology to remind users to remove their devices at the end of the day and geo-fencing to ensure that wearable devices are disabled when out of range of a given location.

Integration is an ongoing issue as well. “Integrating the new wearables platforms with our existing systems requires a deep understanding of both the current and future technology offerings,” says Peterson. “Maintaining a strong relationship with technology partners allows us to explore options, shape technology to provide advanced solutions, and prepare current systems in parallel as the technology continues to advance.”

The platform problem
At Humana, senior vice president and CIO Brian LeClaire says he evaluates wearable technologies from the viewpoint of the health insurer’s customers: What is going to help them achieve their health goals? What is going to blend into their routine? What is going to support them in managing chronic conditions? “Wearable technology offers a verified way to acknowledge and reward our members’ healthy behaviors and efforts to maintain a healthy lifestyle.” — BRIAN LEO CLAIRE, SENIOR VICE PRESIDENT AND CIO, HUMANA,
edge and reward our members’ healthy behaviors and efforts to maintain a healthy lifestyle,” LeClaire says. “From a broader perspective, wearables are a way for us to have daily interactions and engagement with consumers.”

They also provide the $54.3 billion company with a new way to deal with rising medical costs. Humana took a step toward using technology to rein in costs in 2011, when it introduced Humana Vitality, an incentives application for mobile devices. In 2014, the company partnered with Apple to become the first major insurer to track the health information that flowed from wearable devices into Apple’s health tracking app for the iPhone. But in order for the initiative to take off, it had to take a device-agnostic approach. Now Humana supports more than 70 wearable devices, including Fitbit, Apple Health, Garmin, Polar and Jawbone. The approach is working internally. Humana’s own employees participate in the program, and the resulting savings are adding up: Healthcare costs are down 18 percent and sick days have decreased 44 percent for participating employees over the past three years.

Duke Energy is also taking an architecture-specific yet device-agnostic approach. But finding the right platform for each use case is critical — “so that it’s an asset, not a nuisance” to the user, says Vukojevic. Should the camera sit on top or off to the side? Is information delivered directly into the user’s line of sight? “The biggest challenge is to prove that it actually works. But once you do that, you have to figure out what the optimum platform is.” That may differ in the field versus the warehouse. “There’s not going to be just one platform,” Vukojevic says.

To the extent possible, Lockheed Martin aims to develop applications that will enable users to employ the best tool for the job. “In the initial phases, we pursue applications that are both platform- and device-agnostic,” says Peterson. “This allows many teams to utilize today’s platforms, while piloting new platforms like wearables. Having options allows teams to employ the best device to perform the task.”

Adding to the confusion, the wearable vendor market is fluid. “The market is going to mature, and there will be churn,” says EPRI’s Simmins. “If you’re doing an implementation with today’s hardware, you have to know that at some point in the future that technology may not have a path forward.” Companies will be acquired, change focus or go out of business. One vendor may leapfrog another’s functionality.

Accenture’s Blum sees some clients buy wearables in batches. “In most cases, customers assume the [wearable] will be obsolete in a year,” says Blum. “But they’re able to achieve the ROI based on that short life span.”

**End user evangelization**

The enterprise opportunities for wearable devices multiplied at Duke Energy once end users got their hands on the prototypes Vukojevic’s team developed. “That’s where you get the best assessment of the technology,” he says. “Once they try them on, they have 20 new ideas for different use cases.”

His team developed a wearable
solution for warehouse counting and is currently working on one for warehouse picking. It also created a wearable application for training employees. Soon, the team will begin testing wearable video to improve power restoration by providing instant visuals of, say, hurricane damage. Vukojevic is also thinking about how the company might integrate into wearables the real-time data that may come from sensors in the field or beacons in warehouses.

To keep wearables on everyone’s mind and keep implementation ideas flowing, a communications group publicizes progress. “We try to get everyone involved who could benefit from it, because it makes it that much easier to make the business case,” Vukojevic says. “The more people hear about it, the more ideas you get.”

Humana encourages wearable usage by recognizing and rewarding people for the healthy behaviors they already have. In order to get acceptance, “consumers have to see the benefit,” LeClaire says. It’s not clear yet how — or when — wearables will integrate with some enterprise systems. But now is not the time to answer those big questions, says Blum of Accenture. It’s the time to “get devices in the hands of users to experience the benefits that don’t require system integration and may not even require network connectivity,” he says. “Start there to see value of the wearable as a concept.”

Blum worked with Dutch telecom KPN to distribute smartglasses to 100 field engineers repairing telecom equipment. User satisfaction, he says, went up every week. The key is to focus on use cases in which wearables make it easier for people to do their jobs, he explains, noting that “you end up with wearables that mysteriously get broken” if employees think that systems are just meant to squeeze out corporate efficiencies or help big brother keep an eye on them.

Blum also worked with Airbus to introduce augmented reality for installers of seats on the A330 aircraft. The wearable system eliminated errors and improved performance by a factor of six, he says.

Trying wearables on for size

“There are aspects of wearable technology that companies can only fully appreciate by using it firsthand,” says Blum. “Which use cases are best for my business? How will this work with my wireless network? How do I set up governance for it? Will my workers wear them? Those are the perfect questions to answer while the technology is still maturing.”

At the same time, those experimenting with wearables are reaping returns even though they’re just in an exploratory phase. “We’re seeing clients achieve value from wearables,” says Blum. “With every passing month, the hardware gets better and new cases are unlocked. Companies that put in the time today will be a step ahead once the hardware does mature.”

Since Humana’s app is already integrated with a multitude of devices, LeClaire anticipates expanding the wearables program. “Ensuring the data we’re collecting from wearables is made meaningful for the consumer” is critical, he says. “We have to help people take this information and translate it into health. There is tremendous opportunity with wearables, but only if you maintain your focus on...
Enterprises must be mindful of the implications of wearable technology on personal data privacy and security, says Benson of Exosite. “Data generated by wearable technology, such as the location and activity of an employee, could be used for nefarious purposes,” he says. “CIOs are used to dealing with these types of issues across the enterprise, but wearables in particular bring an added complexity and specificity to the data.” Enterprises can ensure that data privacy and security vulnerabilities are evaluated in a comprehensive way if they engage in limited rollouts and collaborate with security and compliance teams from the beginning.

Wearables won’t be right for every company — now or in the future. “Just because a company has an Android or iPhone app doesn’t mean they should port it over to the Apple Watch or Google Glass,” says Blum. But for companies that envision wearables delivering unique business value, he says, “now is the time, with the low barrier to entry, to experiment with a 10-person pilot to learn about the potential of the technology.”

That’s the plan at OCME. “We like to be there first,” says Pezzin. “We’re not afraid of rolling up our sleeves and experimenting. I like the glint in people’s eyes when they see what we’re doing in a very traditional sector. We’re always on the lookout for the next big thing. And our focus right now is on this one.”

It’s unlikely that there will ever be a one-size-fits-all wearable product, so “don’t be afraid to engage new technology partners early,” says Hodge of Lockheed Martin Space Systems. “Because those customizations can make all of the difference between a niche tool and one that can be deployed across the enterprise.”

Stephanie Overby is a regular contributor to CIO.com.
Whirlpool CIO tackles big ERP, IoT initiatives

Mike Heim is replacing an aging SAP deployment with the vendor’s HANA software, and he’s working with IBM on its Internet of Things predictive analytics platform.

By Clint Boulton

If you love a good tale of multitasking on major projects, Whirlpool CIO Mike Heim has a story for you. He’s overhauling the appliance maker’s aging ERP system to improve operational efficiencies, and at the same time he’s embracing the Internet of Things (IoT) to improve the quality and longevity of Whirlpool appliances.

If that sounds familiar to you global CIOs out there, it’s because such diverse project lineups — sometimes conducted under the banner of “bimodal IT” — are par for the course in the digital transformation initiatives CEOs are asking their IT leaders to undertake.

The ERP project is the type of software overhaul that’s familiar to global companies. But the IoT initiative is uncharted territory; it involves analyzing sensor data from household appliances and harnessing the findings to design and build sturdier machines. Heim says capturing the real-time condition of products in that way is “where the future is headed.”
New SAP software
Heim is replacing regional deployments of aging SAP business software with versions of the vendor’s newer HANA platform that will run on a hybrid cloud hosted by IBM. Heim says HANA will simplify business processes and enable Whirlpool to be more nimble. The HANA system will serve as Whirlpool’s operational backbone for the next decade, and Heim says it’s crucial to the stability of the business. “Everybody gets up the morning and doesn’t worry about our SAP environments running until they don’t,” he says.

The ERP upgrade involves its own exercise in master data management. Years of customizations to support new operations, products and SKUs have resulted in complex data schemas. “Business process complexity embedded in your software is like cholesterol in your organization,” Heim says. “Unlike wine, [ERP systems] don’t get better with age.”

One technical advantage HANA affords is that its hybrid architecture enables Whirlpool’s IT department to process transactions and analytics, rather than extracting data from the ERP and dumping it into a reporting database. Combining both jobs in-memory allows IT to analyze transactions in real time. This will enable Whirlpool to conduct integrated demand planning from the market all the way back to the manufacturing stage.

This multiyear project is well underway in Europe and Latin America — where Whirlpool took HANA live earlier this year; it will get started in the U.S. by 2017.

Making connections
Meanwhile, Heim is looking for ways to take advantage of the gradual, yet highly anticipated, rise of connected machines. Specifically, he hopes to optimize the performance and longevity of Whirlpool appliances. Toward that end, he’s working closely with IBM on a predictive analytics platform that uses machine learning algorithms.

The software, which IBM hosts, pulls data from sensors built into the machines and informs Whirlpool in real time about the state of products in the field and consumers’ usage patterns. In lab tests, Whirlpool has learned that colors fade and fabrics grow coarser for certain high-end garments in as few as five washes. Such information could help the company improve its washers by, say, creating custom wash cycles for each user.

Likewise, sensors that track the number of times a refrigerator door is opened can help Whirlpool learn when hinges weaken to the point of breaking. Whirlpool could use such information to develop sturdier parts. “You want to reduce maintenance and warranty costs, but most importantly you create a higher quality product and you have a happier consumer,” Heim says.

Whirlpool isn’t the only company eyeing the potential of IoT technology. Some 4 billion connected things will be in use in the consumer sector by the end of this year, and the number could top 13.5 billion by 2020, according to Gartner.

Yet Heim admits that the rate of adoption of connected appliances is low. Some people are reluctant to buy household appliances equipped with new technologies; they prefer to stick with traditional products. And those products tend to last a long time. “It’s a tough slog to get those connected products in the marketplace,” Heim says.

“Unlike wine, [ERP systems] don’t get better with age.” — MIKE HEIM, CIO, WHIRLPOOL

Clint Boulton is a senior writer at CIO.com.
SQL-on-Hadoop engines: There’s no one-size-fits-all

A new benchmark of SQL-on-Hadoop engines — Impala, Spark and Hive shows which engine is best for different BI needs. By Thor Olavsrud

According to a new benchmark, the three leading SQL-on-Hadoop engines — Apache Impala 2.3, Apache Spark 1.6 and Apache Hive 1.2 — each have unique strengths and weaknesses that make them better-suited to some business intelligence (BI) use cases than others.

For the benchmark, AtScale, a startup specializing in enabling BI on Hadoop, set out to help technology evaluators select the best SQL-on-Hadoop technology for their needs. AtScale’s testing team used the Star Schema Benchmark (SSB) data set, based on widely used TPC-H data, modified to more accurately represent a typical BI-oriented data layout. The data set allowed the team to test queries across large tables: The lineorder table contains close to 6 billion rows and the large customer table contains more than 1 billion rows.

Different ‘sweet spots’

AtScale CEO and founder Dave Mariani explains that the company looked at the following three key requirements to evaluate the SQL-on-Hadoop engines and their fitness to satisfy BI workloads:

- Fast on small data. Engines need to deliver interactive performance on known query patterns and return results in no more than

- Performs on big data. Engines must be able to consistently analyze billions or trillions of rows of data without generating errors, and their response times must be “on the order of 10s or 100s of seconds,” according to AtScale.

- Performs on many data. Engines must be able to consistently analyze billions or trillions of rows of data without generating errors, and their response times must be “on the order of 10s or 100s of seconds,” according to AtScale.
a few seconds on small data sets (on the order of thousands or millions of rows).

- **Stable for many users.** Enterprise BI user bases may consist of hundreds or even thousands of data specialists. Engines must perform reliably under highly concurrent analysis workloads.

  Mariani says he believes these three criteria are representative of the primary requirements the average enterprise doing BI on Hadoop will have to meet. The criteria were drawn from the test team’s experience working with companies in financial services, healthcare, retail, telecommunications and other industries.

  Moreover, “we used real-world enterprise experience to produce a document that every technical evaluator can use as part of their evaluation process,” says Josh Klahr, vice president of product management at AtScale.

  The test team found that all three engines passed the tests and are stable enough to support BI workloads, but one engine does not fit all needs. “The conclusions really are that one engine does not meet all requirements,” says Mariani. “What we have done in our deployments, for our customers, is plug in multiple engines.”

  While Hive is generally considered the default for SQL-on-Hadoop, it was far and away the slowest of the engines in the benchmark, making it poorly suited to interactive queries.

  “If you want to use Hive Tez as your interactive query engine exclusively, the best you’re going to do is 2.4 seconds,” Mariani says. “Hive Tez is the tortoise,” Mariani adds. “It will always finish the race, but not in a spectacular, speedy fashion. It’s the most reliable.”

  Impala and Spark, on the other hand, were at their best when it came to smaller data sets. Impala topped Spark across a gamut of workloads, but Mariani notes that Spark 1.6 offered a vast performance improvement over Spark 1.5, and he expects that trend to continue because there’s a large community of open-source developers who are interested in working on Spark. Cloudera recently proposed donating Impala to the Apache Software Foundation, which could lend additional momentum to its development.

  For now, Impala is the king for use cases that require large numbers of users.

  “Impala kicks butt when it comes to concurrency,” Mariani says. “If you’re going to have a whole bunch of users running small, fast queries, Impala is a much better choice than Spark.”

  “If speed is not a priority, but stability and reliability is, I would choose to use Hive Tez,” he adds. “For those big batch workloads I would choose Hive Tez. If I wanted my BI users to get access to my warehouse, I would choose to use Spark or Impala.”

  Mariani notes that the team didn’t benchmark other engines, like Apache Drill or Apache Presto, but they will next time.

  “You never know between release and release who’s going to be the better horse to bet on,” he says.

Thor Olavsrud is a senior writer at CIO.com.
Building a culture of leadership — and joy

As CIO, Michael Smith focused on succession when transforming Mylan’s IT organization. It worked — and it could continue to pay dividends. **By Dan Roberts and Brian P. Watson**

In December 2012, when Michael Smith arrived at Mylan, company leaders were plotting a new three-year strategy to fuel continued growth. The $9.8 billion maker of generic pharmaceuticals had already come a long way from its humble beginnings as a West Virginia-based drug distributor, but there was much more to come, including some aggressive merger and acquisition plans.

But the new CIO recognized that the IT organization he inherited wasn’t on the right footing to execute on the bold strategy. He had to retool the staff. He had to build a team with new capabilities. He had to essentially remake the department’s culture from the bottom up.

One other important priority: He had to find his own successor. That might sound crazy. Leaders talk about the importance of succession planning, but few actually put coherent plans in place. Smith did so while building his senior team and transforming Mylan’s IT operation. And in the process, he started a leadership-development program that could produce Mylan’s IT leaders for years to come.

“Succession planning is a big part of what I stand for. It’s a moral obligation to the corporation to have great succession planning,” Smith says. “It’s a moral obligation to your team — to let them know where they stand, to be open and transparent, to remove politics, and help explain why people get certain assignments.”

As he settled into the CIO role, Smith, a 22-year veteran of Nike’s IT organization, assessed his new responsibilities and recognized he needed new blood in the senior ranks. To oversee day-to-day
responsibilities for key areas — IT, global business services and data security — he recruited executives from AIG, Amazon, Aviva, Costco, Estée Lauder, Nike and Ranbaxy (one of Mylan’s competitors).

At the same time, he made a commitment to Mylan CEO Heather Bresch that his team would acquire new capabilities that would prove pivotal to executing on her three-year strategy. With even more key additions to his team, Smith built up operations in architecture, digital innovation, enterprise business analytics and more.

The culture issue was trickier. A few years before Smith arrived, Mylan acquired two companies that helped catapult its growth: India-based Matrix Labs, in 2006, and Merck’s generic drug division, in 2007. When he assumed the CIO role, Smith saw that IT exhibited plenty of the overall Mylan culture — “relentless” and “passionate,” in his words — but he also found two subcultures. One existed among the many people who had been with Mylan since before the acquisitions; the other was present in the new talent. The incumbent group was more change-averse, while the newer workers, who had spent their initial time at the company heads-down on integrations, tended to be more reactive.

There wasn’t much forward thinking, Smith says. Innovation was pretty much nonexistent. And it wasn’t a lot of fun.

So he set out to build on the best pieces of Mylan’s culture and also empower his team to take more calculated risks. But it went further: It was also about bringing forth new ideas, developing talent and celebrating successes.

He summarized his vision for the new ethos in a word: joy. “Fun dissipates, but joy is sustaining,” he says. “One definition of joy talks about a sense of achievement, a sense of well-being — that’s what I want.”

Building a culture is always a work in progress, but Smith says he’s seeing big gains. He and his team continue to bring high-level talent to Mylan’s Pittsburgh headquarters, and they’re seeing increased employee engagement through events like hackathons and Lions’ Den (an in-house take on the TV show Shark Tank).

And Mylan has experienced dramatic growth — it finished 2015 with $9.8 billion in sales and forecasts around $11 billion for this year — outperforming both the generic pharmaceutical sector and the broader market in terms of revenue growth. And while transforming the company’s IT and shared services operations, Smith began to see his earlier investments in talent pay big dividends — so much so that, in December, one day after his third anniversary at Mylan, Smith was promoted to global head of digital innovation and global business services.

In his new role, Smith will oversee all innovation for Mylan. He declined to disclose specifics about what that entails, except to say that the company would be morphing from a generic drug maker into more of an end-to-end healthcare enterprise. Smith will also oversee the digital marketing, e-commerce and digital health initiatives.

Dan Roberts is CEO and president of Ouellette & Associates. Brian P. Watson is co-head of CIO Networks at Metis Strategy.
The Apple-FBI case will have a lasting impact

IT must assess the risk of system back doors. BY PETE LINDSTROM

The Apple-FBI case brought a lot of attention to the challenges of maintaining security and privacy in the face of competing needs. But one argument fell into the domain of cybersecurity professionals: Apple’s contention that creating a back door for the FBI would have increased long-term risk by making its system less secure. Apple suggested that if it had bypassed its security measures in this instance, it would have been compelled to do so in similar situations in the future. That would have compromised Apple’s update process and opened a de facto back door to encrypted data.

In the end, the FBI managed to access data in the iPhone used by one of the suspects in the San Bernardino shooting on its own, without Apple’s cooperation. But security professionals must be prepared to assess the risk associated with such scenarios in the future by focusing on probability — a function of vulnerabilities (the elements in a process and/or architecture that can be attacked and compromised) and threats (actors and actions that breach systems).

While Apple was reluctant to accede to the FBI’s request and modify its software, it and other software makers already provide automatic updates and patches to their systems, and certain aspects of that code update process are inherent vulnerabilities.

On the threat side of such cases, we must evaluate whether the knowledge gained from bypassing a system and/or the software itself will somehow give would-be hackers more motive and make it easier for them to compromise systems in the future. Apple protects code-signing keys and other important elements.
Law enforcement already has authority to wiretap communications.

But it’s easy — and common — to develop means (for example, ransomware) by which one entity can gain access to encrypted data through an avenue other than the original encrypting key itself. Also, organizations routinely have backup keys for decrypting the data of departing employees. Microsoft recently admitted that it does this for its users, and it is accepted as common practice.

Solutions beyond the emotions
Whatever access is required, there are many options that remain unexplored because of the emotions attached to the case of the San Bernardino gunman’s iPhone. Software manufacturers routinely build in access to their systems; security professionals routinely strengthen the access in various ways. Law enforcement already has authority to wiretap communications. Some combination of these elements, or some newer capabilities, could provide a satisfactory solution. On the newer capability side, split key designs, technical escrow models, and options that force segregation of duties have not been publicly discussed or evaluated.

Of course, a more formal software back door increases the attack surface — the vulnerability side of the equation. In that respect, the users of Apple products are better off with a process-oriented “attack” of the type advocated by the FBI than they would be with the designed-in access that may ultimately be a requirement.

It’s obvious from the Apple-FBI case that heightened interest in a more formal back door will likely result in a law that requires some form of access. And if it doesn’t, we should remember that the opportunity for “lawful hacking” by law enforcement still exists.

Ironically, Apple’s presumed interest in protecting its users in this case may speed the company and its users to access that will ultimately make them less secure.

Pete Lindstrom is vice president of security research for IDC’s IT Executive Program.
How a mobile developer found his calling

What does it take to prepare for, land and succeed in the hottest roles in IT? This month, we look at how Chris Turner pivoted a successful Web development career for the ‘mobile first’ era.

BY SHARON FLORENTINE

Programming didn’t come naturally for Chris Turner. He planned to focus on engineering when he entered Lock Haven University in Lock Haven, Pa. “I had no idea what I wanted to do. I took a Programming 101 class, and that really clicked for me — but it was extremely difficult. The only experience I had with computers was AOL Messenger. Everyone else was talking about how they’d coded on their Commodore 64, and I was literally starting from nothing. I had to work twice as hard as everyone else in the class to understand the concepts and the practices, and I ended up neglecting my other courses,” Turner says.

After a lackluster first year, he dropped out.

In the early 2000s, after a stint at a technical trade school at a time when jobs were scarce as a result of the dot-com bust, Turner returned to Lock Haven and declared a major in computer information systems (CIS), which

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<tr>
<th>ROLES</th>
<th>Mobile developer, application developer, Web developer, UI developer/designer, UX designer/developer</th>
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<tbody>
<tr>
<td>MINIMUM EDUCATION</td>
<td>None — can be self-taught, though formal education is recommended</td>
</tr>
<tr>
<td>RELEVANT AREAS OF STUDY</td>
<td>Math, science, engineering, communications, art, design, psychology</td>
</tr>
<tr>
<td>TECHNOLOGY SKILLS</td>
<td>iOS, Android, JavaScript, HTML, Web scripting</td>
</tr>
<tr>
<td>POTENTIAL EMPLOYERS</td>
<td>Organizations of all sizes, independent contractors</td>
</tr>
<tr>
<td>NATIONAL MEDIAN SALARY</td>
<td>$77,400</td>
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not only emphasized hard technology skills, theory and practice, but also incorporated business, economics and communication skills.

**On-the-job training**
While working as a Web developer at an insurance company, Turner met one of his first mentors: Simon Horwith, an instructor and consultant who led a ColdFusion and Flex training program that Turner attended in Maryland.

“[Horwith] was just fantastic; I learned so much from him about architecting solutions and consulting with clients,” Turner recalls. “I wanted to learn everything I could from him, so when he came to Lock Haven to help with a big insurance project, I took him out for a beer and grilled him about everything he could teach me.”

That relationship led to Turner being offered a position at Horwith’s consulting company, where he spent a few years working on increasingly larger and more technically advanced Web development projects for government clients, including the National Institutes of Health.

“I started jumping on every project I could find that would teach me something new,” he says. “I would find the smartest person in the room and pepper them with questions about how they were approaching problems, why they used certain solutions to solve them. I could not get enough — I wanted to learn everything I possibly could.”

That persistence and willingness to learn paid off when Turner was named project lead for a large-scale Web development project for a Texas city. He admits that he was nervous about putting his skills to the test, especially because the project was on an almost-impossibly-tight deadline. But he buckled down and pulled it off without a hitch.

“That was terrifying. But it was what I’d been working toward, and I had no choice but to jump in and do it,” Turner says. “We hit our deadlines, we rolled out the site — and they loved it.”

**A new direction**
After a move to Connecticut, Turner began dabbling in iOS development and landed a job at ESPN working on the sports media giant’s Sports Center application and the Tournament Challenge App. His background in
Web development and his knowledge of ActionScript and Flex translated well to mobile development. And while he was there, he embraced agile development, though he says it was less of a mindset shift than a matter of organizing best practices he’d learned over the years into a formal framework.

As a mobile developer at iDevices, a connected home application development company, Turner found himself working for the first time on an app without a server back end, which was a new and exciting experience.

“I also had the opportunity to work on our Apple Watch app, which started with supporting the iGrill application and has evolved into controlling any HomeKit products a user has. I’ll never forget the thrill I had the first time I turned off my lights by tapping a button on my watch,” he says.

**Mobile is money**
Mobile development is a hot specialty nowadays, and talented developers like Turner are in high demand. “Mobile is on the front lines of what companies are doing in development — the ‘mobile first’ strategy means that now everything is created for use and views on a mobile device first,” says Michael Sage, chief evangelist at BlazeMeter, which offers a self-service load-testing platform as a service.

When Sage searches for developers, he looks for people with a solid combination of technical and soft skills backed up by real-world, on-the-job examples of success. While he believes a four-year degree is important, he focuses more on evaluating the projects developers have worked on, and assessing their ability to work cross-functionally with people in other departments.

And Turner says that’s the part of his job that he likes best.

“What I do is really unique. I’m not only writing code for a back-end system, but I’m helping to design and capture the user experience through an interface,” Turner says. “That’s my absolute favorite part — to talk to users and figure out how they see things, how they need technology to work, and then thinking about how to make that beautiful, intuitive and seamless. It’s amazing.”

—Chris Turner

Sharon Florentine is a senior writer at CIO.com.