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TECH FORECAST 2016

Your Essential To-Do List for the Year Ahead

» *As IT transformation accelerates,* **here's where to focus your resources.**

COMPUTERWORLD

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NEWS ANALYSIS | BUINESS INTELLIGENCE

IBM Bets Big on Data and IoT With Weather Co. Buy

The deal shows that Big Blue is serious about beefing up its abilities to collect and synthesize data — and turn it into useful real-time information for companies. BY KEN MINGIS

AFTER WEEKS of rumors of an impending deal, IBM has agreed to buy Weather.com and other digital assets from The Weather Company for its Watson IoT unit and its IoT Cloud platform.

Specifics of the deal, announced in late October, were kept under wraps; it's expected be completed in the first quarter of next year.

The move indicates that IBM is serious about pushing into the cloud and connecting the data stored there with data being collected via the Internet of Things. IBM's goal is to use the combined technologies — and its Watson cognitive computing system — to provide useful data to companies in real time.

Cloud Data a Draw

IBM is buying The Weather Company's mobile and Web-based products, though not the TV-based Weather Channel. (The TV channel will license forecast data and analytics from IBM under a long-term pact.) IBM is particularly interested

HARRY CAMPBELL ILLUSTRATION

in The Weather Company's dynamic cloud data platform, which powers its mobile app and can now handle 26 billion inquiries a day.

That platform is built to collect data at massive speed and scale and can analyze information from 3 billion weather forecast reference points, more than 40 million smartphones and 50,000 airplane flights each day. The result: IBM will be collecting huge amounts of global data for deeper, more relevant insights via Watson.

> **[A.I. systems] need two things: They've got to be good at understanding questions, and they have to know about the world.**
>
> **ANDREW MOORE,** DEAN, SCHOOL OF COMPUTER SCIENCE, CARNEGIE MELLON UNIVERSITY

Companies using IoT systems will get a "significant competitive advantage as they link their business and sensor data with weather and other pertinent information in real time," said John Kelly, senior vice president for IBM Solutions Portfolio and Research.

IBM envisions using a combination of predictive weather analytics and real-time analysis of social media chatter to, for example, help retailers get goods where they need to go before severe weather hits.

To be truly effective, intelligent systems like Watson must be able to tackle complex questions and handle vast amounts of data simultaneously. With the purchase, IBM gets weather data and analytics tools it can use in multiple industries, as well as a robust IoT platform it plans to extend even further to collect data from any source or sensor-enabled device.

"When you are talking about A.I. [artificial intelligence systems], they need two things: They've got to be good at understanding questions, and they have to know about the world," said Andrew Moore, the dean of Carnegie Mellon's School of Computer Science.

Moore, a onetime Google vice president who worked on several of the company's A.I. projects, said he thought IBM's acquisition was a smart one and added that other tech vendors will likely follow suit and move to enhance their own systems with stores of data.

Action, Not Entertainment

Joel Cawley, general manager of IBM's Information and Insight as a Service unit, said the company is looking to deliver "actionable" insights, not "entertaining" ones. Such insights would come from weather data being integrated into decision making. Data that's collected from countless sensors —and from comments and posts on places like Twitter and Face-

book—can be quickly analyzed during storms to provide better insights for users such as retailers and even emergency management operations teams.

"Accuracy in the retail environment means you can do the forecast down to the store location," said Cawley.

The number of data sources around the world "is exploding," he said, thanks to recent declines in the costs of IoT sensors used to gather information.

The trick—and something IBM's data scientists are focused on—is extracting relevant information from all the noisy data those sensors generate. According to Moore, as more data flows in, "the chances of something going wrong go up dramatically."

> **You can do the forecast down to the store location.**
>
> **JOEL CAWLEY,** GENERAL MANAGER, IBM'S INFORMATION AND INSIGHT AS A SERVICE UNIT

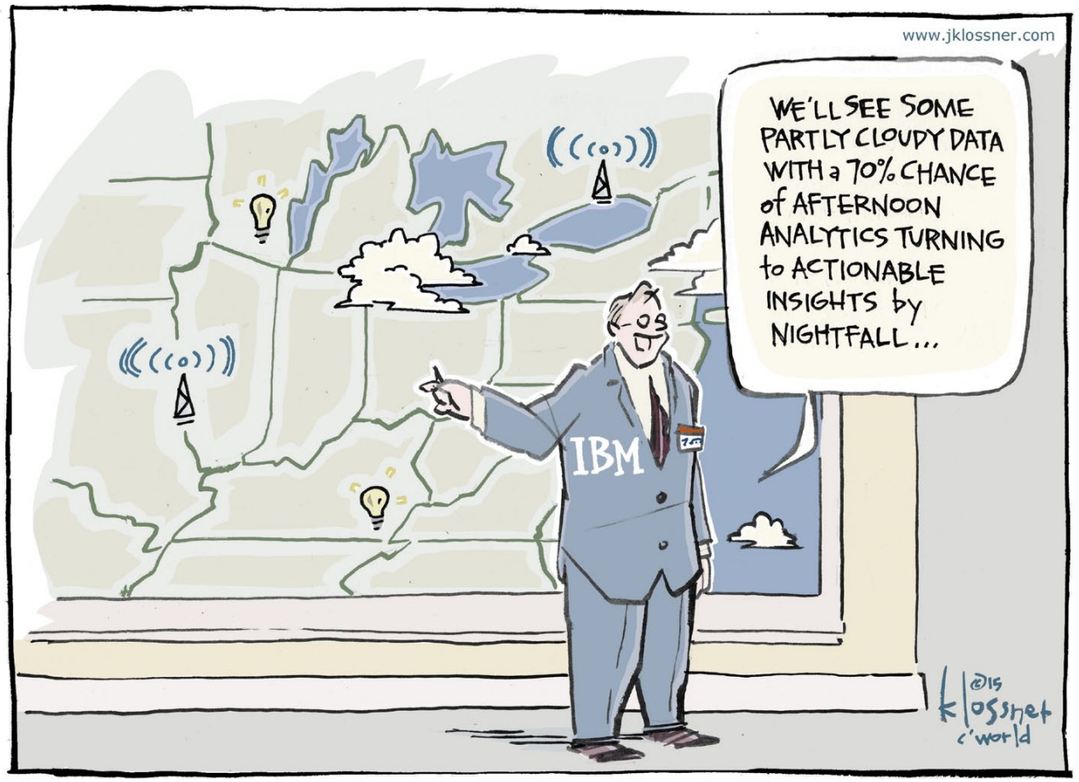
Social Media Insights

That's why IBM wants to analyze social media posts: They can provide context for the sterile data coming from sensors. A combination of weather data with Twitter posts has more value than if the two sources were considered separately, according to Ryan Fogt, an assistant professor of meteorology at Ohio University.

The IBM-Weather Company deal builds on a strategic alliance that the two companies announced earlier this year. Under the previous agreement, IBM licensed The Weather Company's powerful cloud data platform and collaborated with its B2B division on various products and services.

IBM's efforts to augment its Watson platform go beyond just the addition of the Weather Company's digital assets. In another late October announcement, IBM revealed that six new partners will use Watson to develop new cognitive computing apps and services. Those partners are Engage, Macaw Speech, Opentopic, StatSocial, Vennli and Domus Semo Sancus. ◆

BETWEEN THE LINES | JOHN KLOSSNER



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Overcoming Our Auto-Petulance

DO YOU EVER FIND YOURSELF resisting doing something that you know you need to do? I'm not talking about everyday procrastination: wandering to the refrigerator, talking to a co-worker or reading your favorite news site to delay some nonpreferred task. I'm not even talking about those times when you say to yourself, "I don't want to do that," but then slump your shoulders, hold your nose and dive in anyway.

I'm talking about those times when you absolutely refuse to do something and your refusal makes you feel like a kid determined not to eat his broccoli, even if it means sitting at the dinner table until he turns 18 and no longer has to comply with his parents' demands. But in this case, you're not rebelling against a parent, a boss or any other authority figure. You're refusing to do what you have told yourself you need to do. In effect, you are rebelling against yourself. I call it "auto-petulance."

I'm prone to it myself. Some of the things I might say when I'm in the throes of auto-petulance include: "I don't want to go to the gym today, so I'm not going to." "I don't want to answer that email now, so I'll move on to something else." "I don't want to write that documentation today, so I'm going to work on that new project."

Obviously, this sort of behavior gets in the way of accomplishing your goals. If you need to complete 20 tasks to finish a project and just one of them triggers your auto-petulance, the project will never be completely done. And if the task you resist is related to career development, your opportunities to progress will be curtailed, perhaps severely.

But auto-petulance can affect more than just progress toward your objectives. It can affect your relationships at work as well. If you consistently fail to deliver on your commitments, or if the quality of your work suffers, you can end up with a bad reputation. A history of succumbing to auto-petulance can give your supervisors and co-workers a

sense that you are disengaged, unreliable or undisciplined.

But perhaps worse, it can give you a negative view of yourself as someone who is out of control, lazy or temperamentally unfit for your job. Your negative judgments about yourself will extend beyond your behavior to your character. And when you think of yourself as irreparably damaged, it's easy to just stop trying. You become a victim of your own self-image, transforming yourself into the person you fear you are.

So how do you combat auto-petulance?

First, you don't have to convince yourself that you really *want* to do the things that need to be done. That's just silly. If you hate doing something, pretending that you like doing it isn't going to change anything. Denying reality is a poor way to start.

No, when you're confronted with a task that you don't want to do, accept that it's OK to feel that way. That's how you feel, and you should acknowledge it to yourself. What you don't want to do is to think, "I don't want to do that, so I'm not going to." Instead, you have to train yourself to accept that, "I don't want to do that, *and* I will do it."

greater sense of accomplishment when you finish the thing you really didn't want to do and move on to something you'd rather do. You'll start seeing yourself as powerful and effective. And who doesn't like feeling competent?

Beyond that, ask yourself how often you tell yourself,

Succumbing to auto-petulance can give you a negative view of yourself as someone who is out of control, lazy or temperamentally unfit for your job.

Can it really be that simple? Yes, it can. With that short thought, you are giving yourself permission to feel what you feel while recognizing that you don't have to love doing something in order to do it. And once you've done this a few times, you'll notice that you have a

"I don't want to do that, and I will do it." If it happens with more than half of the tasks you face, you probably should think about finding a new job. But if you love 80% of what you do, admit it: You're pretty lucky. There are lots of folks who hate every minute at work. ◆

THE Grill

Michael Nilles

Schindler Group's CIO sees a huge role for the Internet of Things in improving customer experience.

FOR NEARLY 150 YEARS, *Schindler Group has been moving people. The Lucerne, Switzerland-based company makes, supplies and services elevators, escalators and moving walkways. As it moves toward the future, Schindler is deploy-*

- **Family:** Married, with two daughters
- **Best advice you've ever received:** "After a marathon, enjoy the victory lap, and don't start to think about the next marathon yet. The idea is that you shouldn't run marathon after marathon. You should stop and celebrate achievements, so you can head into your next marathon better."
- **Are you a runner?** "Yes, I am, but not a marathon runner."
- **Hobbies:** Spending time with my kids, tennis, running and sailing.

ing smart equipment capable of sharing information with back-end systems and, among other things, sending alerts about maintenance needs to service personnel.

CIO **Michael Nilles** *has been instrumental in spearheading efforts to develop smarter, more advanced systems and enable a more mobile and connected workforce. In addition to leading IT operations, he's also CEO of a new unit called Schindler Digital Business, which tackles innovative projects with emerging technologies to further the company's digital transformation. His work earned him the 2015 MIT Sloan CIO Leadership Award, which recognizes CIOs who lead their organizations to deliver business value and use IT in innovative ways.*

Why do you have two titles? Being CEO of the digital unit is really reflecting the next evolutionary step in our digitalization. It's our innovation unit within our corporation, and it helps us have a much more holistic view and to fast-forward our digitalization effort.

"Business transformation" is a popular buzz phrase these days. How do you define it? What is unique to business transformation is that you're doing some game-changing adaptation to your business model to stay at the forefront of your industry. That's how I define it. The industry could be challenged by competitors who weren't even in the business before. Business transformation in our traditional industry happened in three waves. The first was globalization; companies used to be extremely decentralized, everything was more by country. Then the next big wave was operational excellence, where we optimized our internal business processes to drive major optimization. And now we're in this phase we call leading-edge digital business, which is bringing substantial changes to the business model.

> **What is unique to business transformation is that you're doing some game-changing adaptation to your business model to stay at the forefront of your industry.**

Is there a metric to measure transformation? It's really looking toward disruptive opportunities. With digital transformation, it's much more focused on top-line growth. You want to dig into new market opportunities. Now we're looking into new fields of business, and that's what requires the entrepreneurial long-term visioning approach.

You talk about building a global business process platform and IT rationalization. What did these bring to your company? This again comes back to the three phases. The first one was IT rationalization, where you standardize IT infrastructure, retire legacy systems, harmonize your IT architecture to lead to high efficiency.

The next big phase was the global business process platform where you build up and harmonize your processes and standardize them on a global scale. This helps you establish a global supply chain and

manufacturing network in a standard and coordinated fashion. It's helping you to gain operational excellence and helping your organization to standardize. But at the end of the day, it's something that our competitors can replicate. It's just a matter of time. So you can lose your competitive advantage. So we thought about that and asked, "What is game-changing, and how can we make a sustained advantage that can't be replicated?" Now we want to dig into the leading digital business area where we can obtain a sustained competitive advantage.

How did you obtain that? We made our products smart with the Internet of Things. We equipped our service force with a digital tool case based on iPhones and iPads. But they couldn't work on this digital platform if we hadn't invested in the global business process platform first.

"Digitalization" is another term thrown around a lot. How do you define it? A lot of people say it's just a new buzzword, and a lot of ideas were there before, like machine-to-machine communication. But it has reached a high maturity stage not just in terms of technology but in acceptance on the business side. It's very high. People are ready for this disruptive innovation. So that's why it's not a technology transformation; it has become the business transformation.

Digital is certainly game-changing. It's allowing for new platforms, you're creating new ecosystems, and therefore allowing new opportunities. We're not talking here about technology, it's more about a new transformative approach. In this regard, digital is not just replacing the term *information technology*; it's making use of information technology, but there are more elements to it.

In the past, we were looking to individual technologies and how they could enable certain business processes. Digital is not really focusing on internal processes and cost optimization;digital focuses more on the market, customers and top-line growth. It's a much more holistic and comprehensive approach to doing business.

You also serve on a board of directors for a medical devices company. How has that helped you in your CIO role? It's helping quite a lot. In the role on the board of directors, you have a strategic part. You're working on disrup-

To be a leader in business today, "you have to be a risk-taker and lead disruptive change," Nilles says.

tive business models, services and products. And it has an oversight aspect where you're looking at large transformation projects. And there's a defense part, when it comes to cybersecurity. It's an ideal mix. As CIO it's helping you because you understand much better what are strategic business decisions: How would you extend your product portfolio? How do you enter into new markets? It's helping you get a much more comprehensive business view.

How does Internet of Things fit into your organization? For Schindler and our industry, it's playing a fundamental role, because our products are now made smart. If you think about our lifts and escalators, you can measure their health. They are connected, and there are many data points—speed, temperature, door leveling—and you can make use of that data. You make use of it through a big analytics engine.

You can predict, for instance, when an elevator would need service before a customer knows about it. And we use it in a closed-loop service process—we call it a digital service platform. So the elevator tells you about its health, and our service unit and customers know about it. If you're a manager in a department store chain, you would not know immediately if your escalator was broken, and when you finally noticed it, you would call for service.

Now the customer has an app and can see the status, and the service technician knows right away and can keep the customer informed. For us, this is a real game-changing technology. It's changing from a reactive to a proactive service model.

What are the top challenges for IT in supporting this? It's not just about the technology. It's about thinking through the processes with the different business partners. This is where unity of effort plays a part, because it's working with people in the industry and outside the industry to enable this completely new service model. There are huge technology changes involved as well, but it's really about how we make a new customer experience. That's the focus. That's why we just don't look at the Internet of Things, but we holistically looked at the customer experience and came to the conclusion that the Internet of Things was a big part of it.

What do you see as the top qualities needed to be a leader in business today? It's super essential to build relationships and drive change. You have to be a risk-taker and lead disruptive change. It's very important to inspire people, and to engage them to take risks. That's not so different from being a good CIO in the past, but it's more important now. ◆

Interview by **MARY K. PRATT,** *a* Computerworld *contributing writer in Waltham, Mass. (marykpratt@verizon.net).*

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RICHARD BORGE ILLUSTRATION

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Your Essential To-Do List for the Year Ahead

» *As IT transformation accelerates,* **here's where to focus your resources.**

5 FAST-TRACK TRENDS to Tackle Now

IT will drive business change in 2016 thanks to these key tech developments. **BY BETH STACKPOLE**

OF ALL the burning questions that keep tech execs awake at night, perhaps none is more urgent than, "Are we keeping up?" The breakneck pace of change in IT and in business at large means that CIOs and other senior technologists can't afford to lose focus as they head into 2016.

Where should you center your efforts as you build your to-do list for the year ahead? *Computerworld*'s Forecast 2016 survey of IT professionals points to five key areas: cloud computing, security, the Internet of Things, analytics, and the emergence of IT as a change agent.

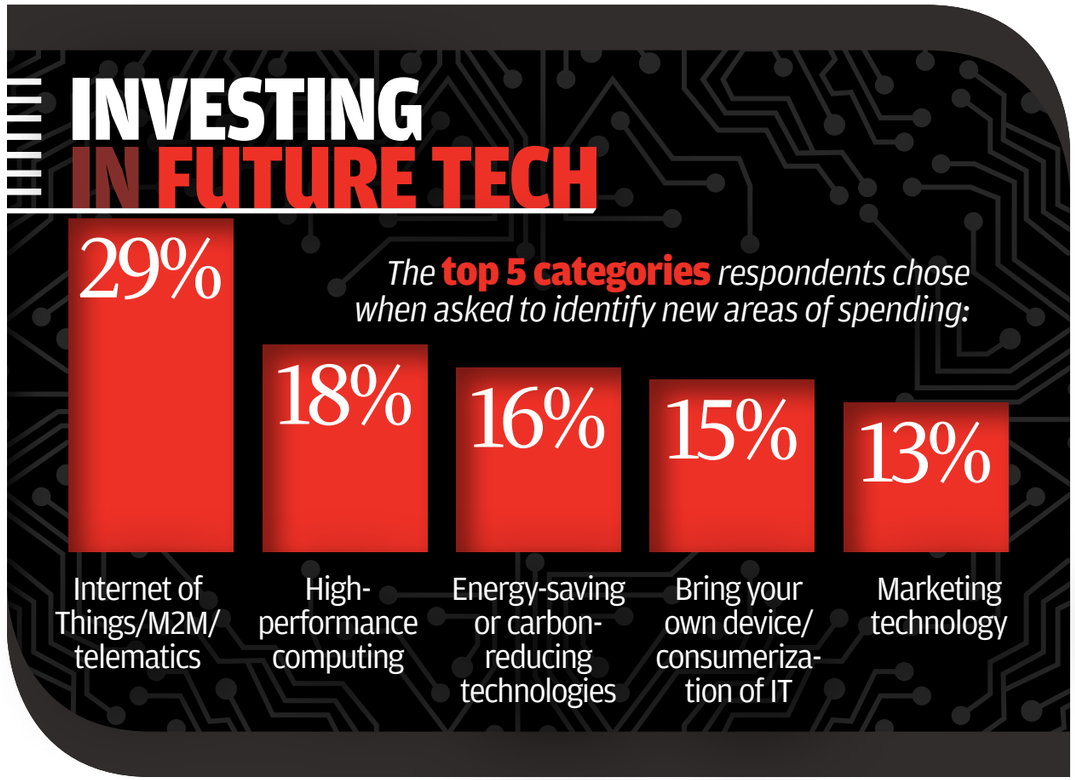
Here's a rundown of survey findings related to each of those topics, plus a look at one trendy technology that gets a lot of buzz but is isn't likely to affect enterprise IT in the near future. Once you're up to speed, strap in and hold on tight—here comes 2016.

1 IT as a Change Agent

IT may finally move fully to the center of the business in 2016, as digital transformation becomes a top strategic priority. CIOs and their tech organizations are well positioned to drive that change, thanks to IT budget growth, head count increases and a pronounced shift toward strategic spending.

"As technology becomes an integral part of every aspect of business and the way we interact with customers, it's raising the profile of the IT group and forcing IT to think about more than just keeping the lights on,"

RICHARD BORGE ILLUSTRATION



Source: *Computerworld* Forecast 2016 survey of 182 IT professionals.

says David Cearley, a fellow at Gartner. "We are seeing greater alignment as IT steps up to drive digital business."

Nearly half (46%) of the 182 respondents to the Forecast survey said that they're gearing up for greater technology spending, with anticipated budget increases averaging 14.7%. (Those numbers are up from last year, when 43% of those polled said they anticipated spending increases, and the average expected uptick was 13.1%.)

At the same time, 37% of this year's respondents said they're planning to increase IT head count, up from 24% last year. Tellingly, 42% of those with hiring plans are in search of people with combined tech and business backgrounds that will allow them to articulate the value of IT in meeting business goals.

Blended expertise will be critical in order for IT to achieve its primary objectives in 2016: 19% of our survey respondents said their mission is to generate new revenue streams or increase existing ones over the next 12 months. Also on the list: accelerating business process and agility (cited by 40% of those polled) and improving collaboration with business units (35%).

While IT has made great strides in moving to the strategic center of the enterprise, there is more work to be done — most of it focused on building relationships with business stakeholders, says Ted Maulucci, CIO of Tridel, a commercial real estate developer in Toronto. Maulucci is actively working on his own relationship-building skills by taking university-level courses in psychology and spending plenty of time talking to business users in the field. "When you are trying to lead transformation and adoption, the most important thing is getting people to take action," he says. "It's a must-have skill for CIOs in today's world."

2 Cloud Computing

As organizations build out a future-proof IT infrastructure, there's little question that the cloud will play a pivotal role — the real challenge lies with figuring out which cloud computing model is the best fit for a particular company.

Nearly half (48%) of the respondents to our Forecast 2016 survey indicated that cloud computing was an area earmarked for a spending increase in their organizations, and 14% cited cloud initiatives as the

single most important technology project on their dockets for the upcoming year. Some 29% confirmed they had already moved some enterprise applications to the cloud, with more to come, while 7% said they're in the process of migrating mission-critical systems to a cloud environment. Moreover, 22% of the respondents said their organizations are currently conducting beta tests or pilot programs that encompass the full stack of cloud delivery methods —including private, public and hybrid options.

Now that the cloud is a standard element of IT architectures, the question facing CIOs is not whether to use cloud-based systems but which implementation model is best for their organizations, according to Gartner's Cearley. "Some things will be delivered in a private cloud model while others will leverage external cloud services, and there will be new types of delivery models," he says.

The cloud lets me respond more rapidly to business demands while reducing risk.

STEPHEN HAHN, GLOBAL IT LEADER, MICHELMAN

For Michelman Inc., a privately held manufacturer of advanced materials for industrial applications, the cloud represents an opportunity to grow, says Stephen Hahn, global IT leader for the $225 million family-owned business, headquartered in Cincinnati. In particular, Hahn is using platform-as-a-service applications for disaster recovery, customer relationship management and other tasks, in addition to using software-as-a-service (SaaS) offerings such as Microsoft Office 365. "If I try to address all the holes I've got [with] services on premises, I won't be able to drive the change needed to support growth," he says. "The cloud lets me respond more rapidly to business demands while reducing risk."

3 Security

High-profile data breaches made for frequent attention-getting headlines in 2015, ratcheting up anxiety and keeping security at the top of IT budgets for the third year in a row.

Exactly half of this year's survey respondents (up from 46% last year) said they will increase spending on security in 2016, making security the No. 1 choice among tech initiatives pegged for spending hikes. When survey participants were asked to identify the single most important technology project currently underway at their organizations, security came in second (chosen by 12% of those polled), trailing cloud computing by just two percentage points. And 16% of those surveyed identified security as their top leadership challenge in the upcoming year, second only to budgetary and economic pressures.

At Nova Southeastern University in Fort Lauderdale, Fla., security and HIPAA compliance are CIO Tom West's biggest concerns. "In the world we live in today, we can get attacked on a daily basis, so the No. 1 thing for me is to make sure we are compliant and secure," he says.

That's no easy task, given the constantly changing IT landscape. Nova Southeastern's se-

> **In the world we live in today, we can get attacked on a daily basis,** so the No. 1 thing for me is to make sure we are compliant and secure.
>
> **TOM WEST,** CIO, NOVA SOUTHEASTERN UNIVERSITY

curity initiatives run the gamut: The school has invested in new intrusion detection/prevention, endpoint protection and encryption products; it employs application and Web vulnerability scanning tools to reduce the "attack surface" of its applications; it conducts regular audits as part of a risk management program; and it recently hired a dedicated chief information security officer.

In addition to ensuring that Nova Southeastern is in compliance with HIPAA when it comes to handling healthcare information, West says there are several other regulations and standards that he has to abide by, including the Family Educational Rights and Privacy Act, the Payment Card Industry Data Security Standard and the IEEE's FIPA standards for agent-based technologies.

In short, he says, "we need to remain constantly vigilant for new types of attacks from the outside as well as from rogue insiders."

THE INTERNET OF THINGS PICKS UP SPEED

Respondents who . . .	2015 FORECAST SURVEY	2016 FORECAST SURVEY
. . . say IoT is a **new area** of spending for their companies.	12%	29%
. . . plan to **launch** an IoT project in the next 12 months.	15%	21%
. . . are **beta-testing** an IoT project.	8%	14%

Source: *Computerworld* Forecast 2016 survey of 182 IT professionals.

4 The Internet of Things

The so-called Internet of Things (IoT) is no longer the stuff of science fiction, but rather a near-future reality for IT organizations across many industries. IoT technologies can be deployed for all kinds of practical uses, such as optimizing supply chains via RFID and monitoring system performance with an eye toward saving energy.

In the *Computerworld* Forecast 2016 survey, 29% of the

respondents identified IoT initiatives — and related machine-to-machine and telematics projects — as new areas of spending for the year ahead. In comparison, just 12% of those polled last year said IoT work would be a new IT expenditure in 2015. Likewise, the percentage of respondents who said they planned to launch IoT projects over the next 12 months rose from 15% last year to 21% this year. Additionally, 14% of this year's respondents said they plan to beta-test IoT technologies, up from 7% last year.

In Toronto, Tridel is on the front lines of smart building construction and is actively using IoT technologies in its senior citizen communities and condominium properties. The real estate development company is designing buildings from the ground up with technologies like commercial-grade IP networks, digital IP cameras and pervasive Wi-Fi. The technology supports an array of amenities, such as health monitoring systems and personal emergency response services in its senior residences, and high-end concierge services in its condominium properties.

> **[The Internet of Things] is huge for us.**
>
> TED MAULUCCI, CIO, TRIDEL

"IoT is huge for us," says Maulucci. "The media tends to overblow stuff, but this time, I don't mind it with IoT. Using portals, networks, sensors and devices, we can build facilities that foster collaboration and are located where people want to live."

5 Analytics

The business world's fixation with big data — specifically with the quest to unearth nuggets of insight — shows no sign of abating.

As companies pivot toward digital business, significant spending on analytics will continue, according to Gartner's Cearley. Business analytics was No. 5 on the list of survey respondents' most important IT projects, and it was No. 3 on the list of technologies that would garner increased spending in the next 12 months.

> BUSINESS ANALYTICS WAS **No. 3** ON SURVEY RESPONDENTS' LIST OF AREAS TAPPED FOR SPENDING INCREASES.

Having organized all of their data, companies are now figuring out how to use it more effectively. At the same time, analytic capabilities are increasingly being embedded into everyday applications and workflows rather than only being available in separate tools, Cearley says. "Analytics are also rapidly bleeding into the whole area of machine learning, artificial intelligence and pattern recognition," he says, explaining that "analytics can help discern patterns that are not clear to human beings."

PrimeLending, a Dallas-based mortgage company, is expanding its analytics initiatives — an effort that includes building a data warehouse — to get better operational visibility and insights into customer behavior. "We are mostly using analytics for competitive intelligence," says Tim Elkins, executive vice president and CIO. "We need to figure out if a consumer we've been

"We are mostly using analytics for competitive intelligence," says Tim Elkins, CIO at PrimeLending.

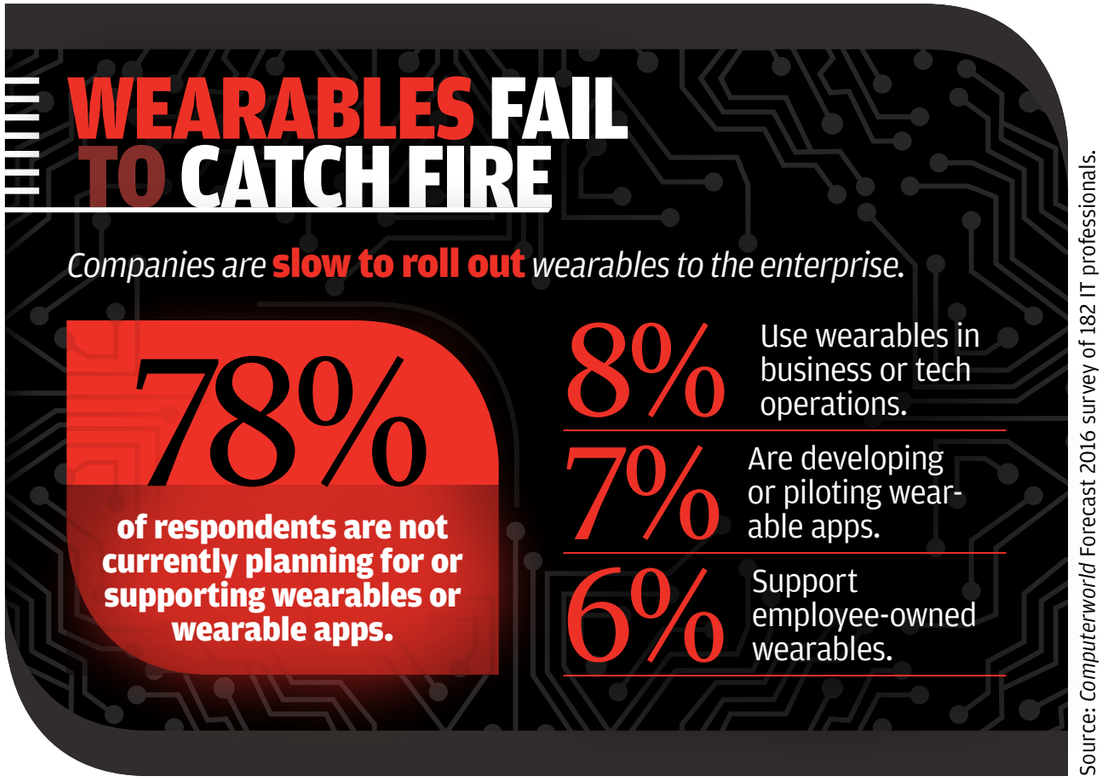
doing business with is getting credit-pooled by someone else, or why we lost a loan. As we explore different business models, we have to do a better job with analytics."

Wearables Can Wait

Answering the question "Are we keeping up?" may require IT leaders to take stock of their companies' efforts in a number of technology realms, but wearables isn't one of them.

While products like Google Glass and the Apple Watch did launch to great fanfare, the reality is that enterprises aren't ready to make practical use of wearable systems, at least for the foreseeable future.

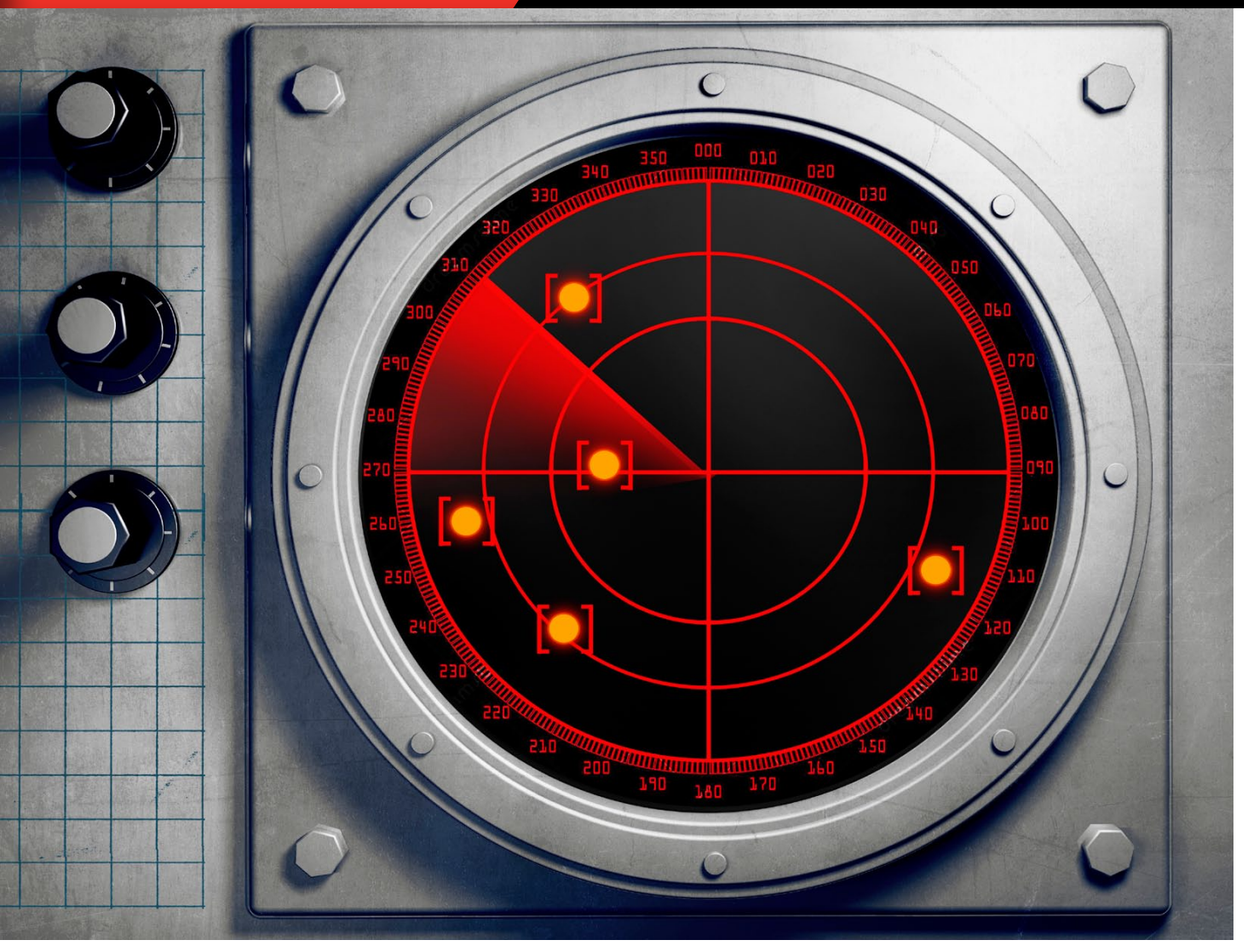
Wearable technology was last on the *Computerworld* Forecast 2016 list of systems currently being assessed in beta tests and pilot projects, with only 4% of our respondents saying they had projects underway involving wearables. Furthermore, 78% said they were not currently working on wearable apps or anticipating the need to support wearables in the near future. And only 8% of those polled said wearables would play a role in their business or technology operations, while just 12% indicated that they were adjusting their mobile device management strategies to include wearables.



Source: *Computerworld* Forecast 2016 survey of 182 IT professionals.

But things may change. West says he's not particularly interested in or concerned about wearables, but he recognizes that the students at Nova Southeastern University inevitably will be. "Eighty percent of our users are students, many at the graduate and doctoral level," he says, "and they're always bringing in new technology and new ideas, which makes for more challenges for me." ◆

STACKPOLE, *a frequent* Computerworld *contributor, has reported on business and technology for more than 20 years.*



5 DISRUPTORS to Keep on Your Radar

Savvy tech execs can't afford to ignore these developments, which stand to remake the future of IT. **BY BETH STACKPOLE**

YOU'VE HONED your list of hot technologies to focus on in 2016, but you also need to make longer-term plans and prepare for changes that are fast approaching by keeping an eye on developments just now taking shape.

What should be on your radar screen as we head into the new year? The 182 IT professionals who participated in the *Computerworld* Forecast 2016 survey singled out these five potentially disruptive technologies and trends: the rise of DevOps, virtualization 2.0, carbon-reducing technologies, the evolution of the IT-marketing alignment, and a sharpening of IT's focus on the customer experience.

Here's a look at what our survey revealed about each of those emerging areas.

1 DevOps

As IT retools to become more responsive to rapidly changing business requirements, methodologies like DevOps are gaining solid footing as ways to support agile IT service delivery.

Considered more of a culture shift than a full-blown development methodology, DevOps emphasizes a greater level of collaboration earlier on in the process between the

IN THE *COMPUTERWORLD* FORECAST 2016 SURVEY,

44%

OF RESPONDENTS SAID THEY PLAN TO EMBRACE DEVOPS THIS YEAR, UP FROM TO 37% LAST YEAR.

RICHARD BORGE ILLUSTRATION

operations and development teams, aided by a set of automation tools. Enterprise IT, under continued pressure to accelerate systems delivery, is rapidly adopting the DevOps philosophy. In the *Computerworld* Forecast 2016 survey, 44% of respondents said they plan to embrace DevOps this year, up from 37% in 2015.

Research firm Gartner also sees an uptick in DevOps adoption as IT organizations look for ways to improve time to production, enhance business value and save money. "Agility is the driver," says Gartner analyst Ronni Colville. "In the old days, if you pushed out a new function and it didn't work, you started over. In the DevOps style of agile development, new applications are developed in a fast-fail manner. They break, but they're never broken."

A sign that DevOps is maturing is the expansion of automation in areas like testing and monitoring. That said, a successful DevOps strategy has less to do with technology than it does with people, Colville says. "People and culture are always the challenge because people have to work together in ways they didn't before," she explains.

> **In the DevOps style of agile development, new applications ... break, but they're never broken.**
>
> RONNI COLVILLE, ANALYST, GARTNER

64% OF THOSE POLLED SAID THEY WERE BETA-TESTING OR PILOTING SOME KIND OF VIRTUALIZATION.

2 Virtualization 2.0

Recognizing that virtualization can reduce costs and wring more performance out of the desktop, IT is now eager to embrace next-generation virtualization technology, which provides similar benefits for other types of systems, not just desktop computing.

Tech professionals participating in *Computerworld*'s Forecast 2016 survey said that they expect to see more money budgeted for virtualization projects over the next 12 months. Thirty-five percent of those polled said they were increasing spending on virtualization efforts, while a combined 64% said they were beta-testing or piloting some kind of virtualization — be it desktop, server, storage, mobile or network.

As an alternative to full-blown virtualization, some organizations are starting to "containerize" their server, data center and cloud applications. "The reason for containers is all about agility and speed — that's what's pushing it today," says Colville.

3 Carbon-reducing Technologies

Companies are paying more attention to

their environmental footprints, and that's prompting a flurry of spending on energy-saving technologies.

In this year's Forecast survey, 16% of the respondents indicated that energy-saving or carbon-reducing technologies would be a new area of spending for them in 2016. In the data center, companies are investing in virtualization, new cooling technologies and power management capabilities, among other things, to help reduce energy consumption.

Nova Southeastern University in Fort Lauderdale, Fla., is in the midst of moving into Verizon's new, world-class data center in Miami. Energy was a top driver in the decision to move off-campus, according to CIO Tom West. "All of our servers will be virtual, therefore taking up a very small footprint and making us very energy-efficient," he says.

16%

OF RESPONDENTS INDICATED THAT ENERGY-SAVING OR CARBON-REDUCING TECHNOLOGIES WOULD BE A NEW AREA OF SPENDING FOR THEM IN 2016.

4 IT-Marketing Alignment

In the age of digital business, technology has become a critical asset in helping companies engage with customers and prospects. As a result, IT and marketing departments are collaborating and forging partnerships that once would have seemed unlikely.

Marketing technology — everything from marketing automation to email campaign management and analytics — is a major new area of interest for our survey respondents: 23% said they plan to increase spending on marketing technology in 2016, and 13% said it is a new area of spending for them. As companies place more of an emphasis on nurturing and engaging customers and prospects through multiple digital channels, there's a need for CIOs and CMOs to work together to drive new innovative use cases, ensure successful implementations and improve overall marketing effectiveness.

Collaboration between marketing and IT is essential at SAS Institute, says CIO Keith Collins.

At SAS Institute, collaboration between marketing and IT is essential given the role technology now plays throughout the customer life cycle, according to Keith Collins, executive vice president and CIO at the Cary, N.C.-based software provider. "Digital transformation

is affecting every area of the business, including how you touch customers, how you find customers and how you engage customers," Collins says. "All of this can't be executed without an effective technology plan, which is why there is so much energy in these partnerships."

5 A Focus on Customer Experience

As companies look to deploy systems that simplify interaction and foster engagement with their target audiences, the customer experience has become a priority for IT.

It's certainly a higher priority for *Computerworld* Forecast survey respondents this year than it was a year ago. Last year, when respondents were asked to rank their top objectives for their single most important IT project, 11% chose "improving customer experience/satisfaction"—putting it last among the list of options presented. This year, that same choice ranked fourth, picked by 16% of those polled.

At mortgage company PrimeLending, IT is pitching in to help reduce friction and streamline the customer experience to make the mortgage process easier and more accessible for potential clients, says Tim Elkins, executive vice president and CIO at the Dallas-based financial services firm. Elkins reports that his team carried out a massive overhaul to PrimeLending's system for handling mortgage applications online, making the process conversational in style. They also created a series of mobile apps that streamline previously paper-laden processes. One of those apps offers a secure way to automatically collect bank statements and other financial information to populate the online forms.

"Customers don't have to enter data, and they don't have to collect forms," Elkins explains. "Now they can go to an open house, make an offer, and enter five to 10 pieces of data in our mortgage app. It then automatically populates the application, runs the credit check, goes through underwriting, and enables them to have approval before they walk out the door. That's our goal." ◆

LAST YEAR, RESPONDENTS RANKED 'IMPROVING CUSTOMER EXPERIENCE/SATISFACTION' LAST ON A LIST OF PRIORITIES FOR IT PROJECTS. THIS YEAR, THAT SAME CHOICE RANKED

No.4

STACKPOLE, *a frequent* Computerworld *contributor, has reported on business and technology for more than 20 years.*

SECURITY Takes Center Stage

After a year of high-profile hacks, **security is top of mind** for tech execs in 2016.

BY JULIA KING

WHEN a high-profile cybersecurity attack occurs, like the ones at Target or Home Depot, Sam Redden knows to be ready. It's almost a given that Redden, chief security officer at Brazos Higher Education Service, a Waco, Texas-based company that services billions of dollars in student loans, will be summoned to brief his worried board of directors.

Redden says he lays the groundwork for such command performances by proactively communicating with the board on an ongoing basis to keep them up to date on everything that IT is doing to protect the enterprise and how his team is preparing for the inevitable.

Even then, "I wouldn't be foolish enough to say I stay ahead of the bad guys," says Redden. "The bad guys stay ahead of everybody."

That observation is likely the reason why 50% of the 182 IT professionals who participated in *Computerworld*'s Forecast 2016 survey said they plan to increase spending on security technologies in the next 12 months. What's more, when respondents were asked to name the most important technology project currently underway at their organizations, security came in second—chosen by 12% of those polled—trailing cloud computing by

50%

OF THE 182 IT PROFESSIONALS WHO RESPONDED TO OUR FORECAST SURVEY SAID THEY PLAN TO INCREASE SPENDING ON SECURITY TECHNOLOGIES IN THE NEXT 12 MONTHS.

RICHARD BORGE ILLUSTRATION

TOP PROJECTS, TOP PRIORITIES

Top 5 single **most important** *projects that respondents said their IT departments are working on:*

Cloud computing	14%
Security technologies	12%
Legacy systems modernization/replacement	10%
Application development, upgrades or replacement (includes mobile apps)	9%
Business analytics	9%

Primary goals *for those projects:*

To maintain or improve expected service levels	24%
To generate new revenue streams or increase existing ones	19%
To increase productivity	17%
To improve customer satisfaction/experience	16%
To meet security, privacy or compliance goals	14%

Source: *Computerworld* Forecast 2016 survey of 182 IT professionals.

just two percentage points.

"When you look at the amount of money big organizations [spend] to prevent breaches and they still get breached, you've got to assume you'll be attacked too," says Dale Denham, CIO at Lewiston, Maine-based Geiger, a $150 million distributor of promotional products. "You have to have a plan in place."

Attackers are getting more numerous, better organized and more powerful. And the number of entry points they can use to access vulnerable networks is rising exponentially as televisions, printers, cameras and even cars are IP-enabled. Gartner estimates that the number of connected things in use will hit 4.9 billion by the end of this year, up 30% from 2014, and will reach 25 billion by 2020.

One recent example of the ever-evolving kinds of security threats enterprises are facing is a piece of persistent malware dubbed SYNful Knock that was discovered in September on Cisco routers.

"It's the first time anything has been publicly disclosed about an exploit of Cisco routing and switching equipment," says Darren Van Booven, cybersecurity officer for the Idaho National Laboratory in Idaho Falls. "It's a great example of the kind of threats organizations now have to mitigate. They require constant changes in our strategy."

John Nai, CISO at PayPal, says in 2016 he'll pay close attention to "infrastructure hygiene," which, he says, "is super important to us." Beyond that, Nai says he believes in keeping a firm eye on the basics. "A lot of companies focus on advanced capabilities," he notes, "but you really need to be brilliant at the basics: Make sure you're patching your infrastructure, patching your desktops and have the right opera-

> **A lot of companies focus on advanced capabilities, but you really need to be brilliant at the basics.**
>
> JOHN NAI, CISO, PAYPAL

tional capabilities to see what's going on in your network."

Slim pickings in the labor pool is another management concern: There simply aren't enough security professionals to go around, and those who are in the job market can command sky-high compensation packages that are out of reach for many companies.

Those are just a few of the security-related issues that IT leaders lose sleep over. But most of them say they're not staying up late worrying; they're up making plans to take action. They're preparing to fine-tune anti-intrusion strategies, train—and retrain—employees, and create disaster plans for the breaches and attacks they say they know lie ahead.

Bigger Budgets, Better-Trained Users

Security execs may be getting called to board meetings more frequently for explanations, but they're often leaving those meetings with more resources to spend on protecting enterprise systems and data. The high-profile breaches have helped raise awareness among even the least technical board members about the critical importance of security. (See "The Board Will See You Now," page 27, for more on the changing relationship between security and the C-suite.)

"Instead of going to the board or CIO and struggling with justifying every security expense, I have the board and CIO coming to me," says a CISO from a midsize manufacturing company who declined to be further identified.

"In some ways, the high-profile breaches have done the selling for me. It's almost an open checkbook," he says. But make no mistake, he adds: "The threats are still there and they are certainly scary."

Across the board, security managers say they'll spend at least some of the money being added to their security budgets on further investments in awareness and training programs.

"One of the biggest challenges is with employees. Most of the problems we've had come from emails they've opened that could have Trojans or malware," says Redden.

"It all goes back to user training," he adds. At Brazos Higher Education Service, he says, "we've pulled most remote users back in for additional train-

BUDGET BOOMS AND BUSTS

Top 5 categories *where respondents said their companies plan to increase spending:*

Security technologies	50%
Cloud computing	48%
Business analytics	41%
Mobile applications	36%
Virtualization (includes desktop, server, storage, network and mobile virtualization)	35%

Top 5 categories *where they plan to decrease spending:*

On-premises software	19%
Data center consolidation/ optimization/ modernization	18%
Legacy systems modernization/replacement	17%
Hardware	16%
Storage	14%

Source: *Computerworld* Forecast 2016 survey of 182 IT professionals.

ing. We talk about not letting anyone access their laptop. It's not a personal device. We stress that very highly. Endpoint protection is the No. 1 issue."

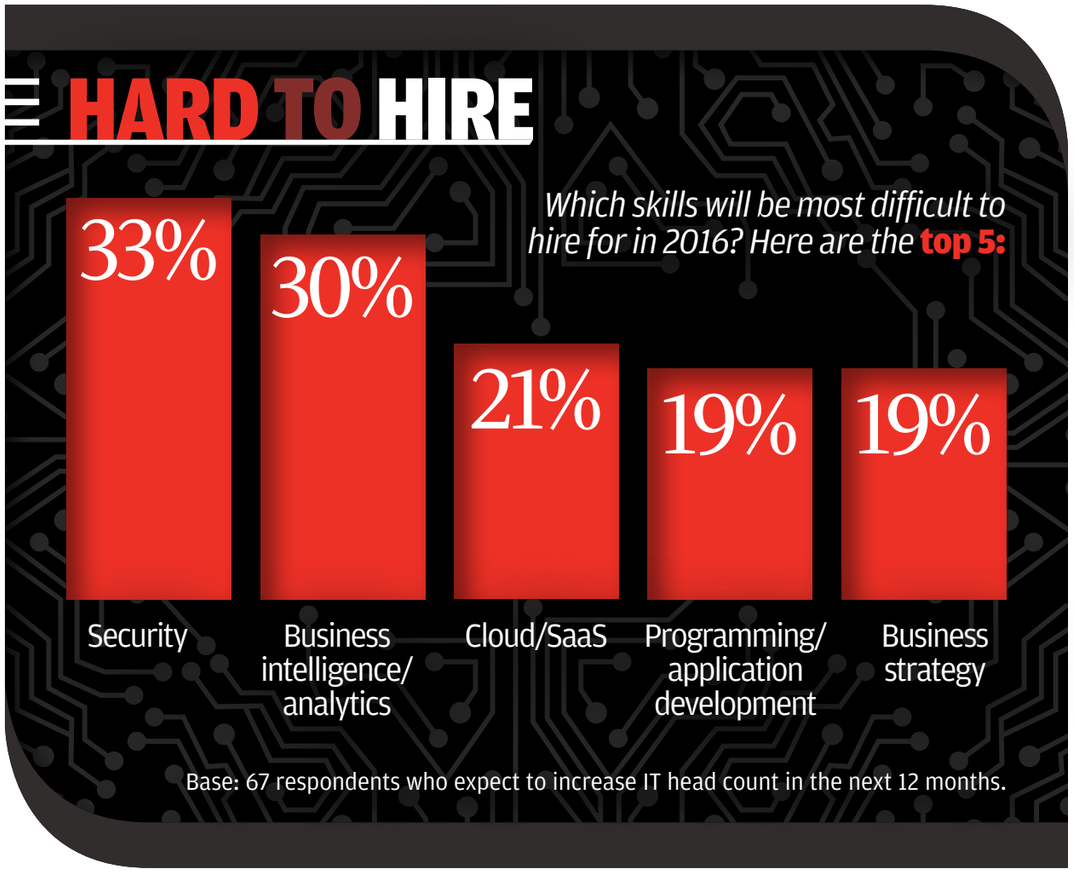
Training is also on the docket at Loyola University Maryland in Baltimore. "Our largest challenge is our end users, so we're really ramping up our cyber awareness training," says Louise Finn, CIO and associate vice president of technology services.

In 2016, the university's recently hired security operations director, Patricia Malek, will be conducting face-to-face scenario-based training with employees in all business units. "And we're not just training on the university's policy, but providing training on the personal side, emphasizing personal control over and protection of data," Finn says.

> **Our largest challenge is our end users, so we're really ramping up our cyber awareness training.**
>
> **LOUISE FINN,** CIO, LOYOLA UNIVERSITY MARYLAND

The Bank of Labor in Kansas City requires employees to take part in a security awareness training program annually. But Shaun Miller, the bank's information security officer, says that schedule renders the program "worthless" because threats change so quickly.

To help people remain vigilant, Miller sends out phishing emails "the same way the bad guys do." If users click on the links in these messages, they're sent to a landing page and get immediate feedback about what they should have done differently. "I'm not doing this to get employees in trouble," Miller says.



Source: *Computerworld* Forecast 2016 survey of 182 IT professionals.

"I'm doing the same thing audit firms would do. People learn [best] from their mistakes."

Hire In or Contract Out?

Among respondents to the Forecast survey who said they expect to add staff in 2016, 25% named security initiatives as the factor driving that decision. And 33% said security was the skill they expect will be the most difficult to hire for in 2016.

In interviews, executives at small and midsize organizations say they will hire people

with broad IT and security skills, rather than highly experienced experts in specific security areas, such as intrusion detection or firewalls.

Many companies are adding expertise not by hiring, but by contracting with the growing number of security services providers. As one CISO put it, one of the advantages of contracting is that it's a way of sidestepping the threat of having sought-after security employees poached by other organizations.

Frankie Duenas, CTO at Cabrillo Credit Union in San Diego, heads a small department of six IT professionals whose duties range from security and networking to programing and daily operations, and he also outsources for security assistance when necessary. "We have a budget in place to throw at security"—either to respond to emerging threats or to respond to a need for more sophisticated security software and/or services, Duenas explains. "We're going to double that [contingency] budget next year because hacks evolve quickly, and we need to have that pot to pull from."

> **We have a budget in place to throw at security. We're going to double that [contingency] budget next year because hacks evolve quickly, and we need to have that pot to pull from.**
>
> **FRANKIE DUENAS,** CTO, CABRILLO CREDIT UNION

THE BOARD WILL SEE YOU NOW … AND NOW … AND NOW … AND …

JUST ABOUT ALL of the security professionals and CIOs interviewed for this article said they expect to put more emphasis on communicating with their boards in 2016.

"Three years ago, unless there was a breach, a person in this role would rarely get to talk to the board. Now it's not unusual to talk to the board once a quarter," says a manufacturing company CIO who requested anonymity. "They're trying to evaluate risk, and they want to feel confident that I'm putting measures in place that are cost-effective and protect the company."

Darren Van Booven, cybersecurity officer at the Idaho National Laboratory, says the success of a risk management and security program hinges on IT leaders having access to, and the ability to communicate with, senior executives.

"It's imperative to understand the business of the organization," he says. If you don't, you can't articulate risks in a way that the leadership understands. "If you hear CISOs saying they're not being listened to, that's why," Van Booven says.

In addition to board members, Van Booven meets with most senior managers to share infor-

At Geiger, Denham says he hires third parties to handle both intrusion detection and intrusion prevention services. The company also works with outside auditors on compliance with the PCI Data Security Standard.

"I don't expect we'll hire more [security professionals into IT]," he says. Instead, Geiger will continue to turn to service providers as new needs arise.

"You're never finished with security. You can't do it all, and you can never do it fast enough," Denham says. "There's always more to do than IT can handle."

The bottom line is that security is a critical enterprise issue that never goes away. It never ends because hackers always find new ways to do damage.

For example, the industry has made great progress in fighting phishing attacks, according to PayPal's Nai, but as it has done so, the bad guys have refocused their efforts elsewhere — on disseminating malware, for example.

"As we continue to improve in certain areas, the bad actors don't go away," Nai says. "They don't go out and get legitimate jobs. They simply move to another attack vector."◆

You're never finished with security.... There's always more to do than IT can handle.

DALE DENHAM, CIO, GEIGER

KING *is a writer and editor in the Philadelphia area.*

Hortense Nelson

mation and provide training.

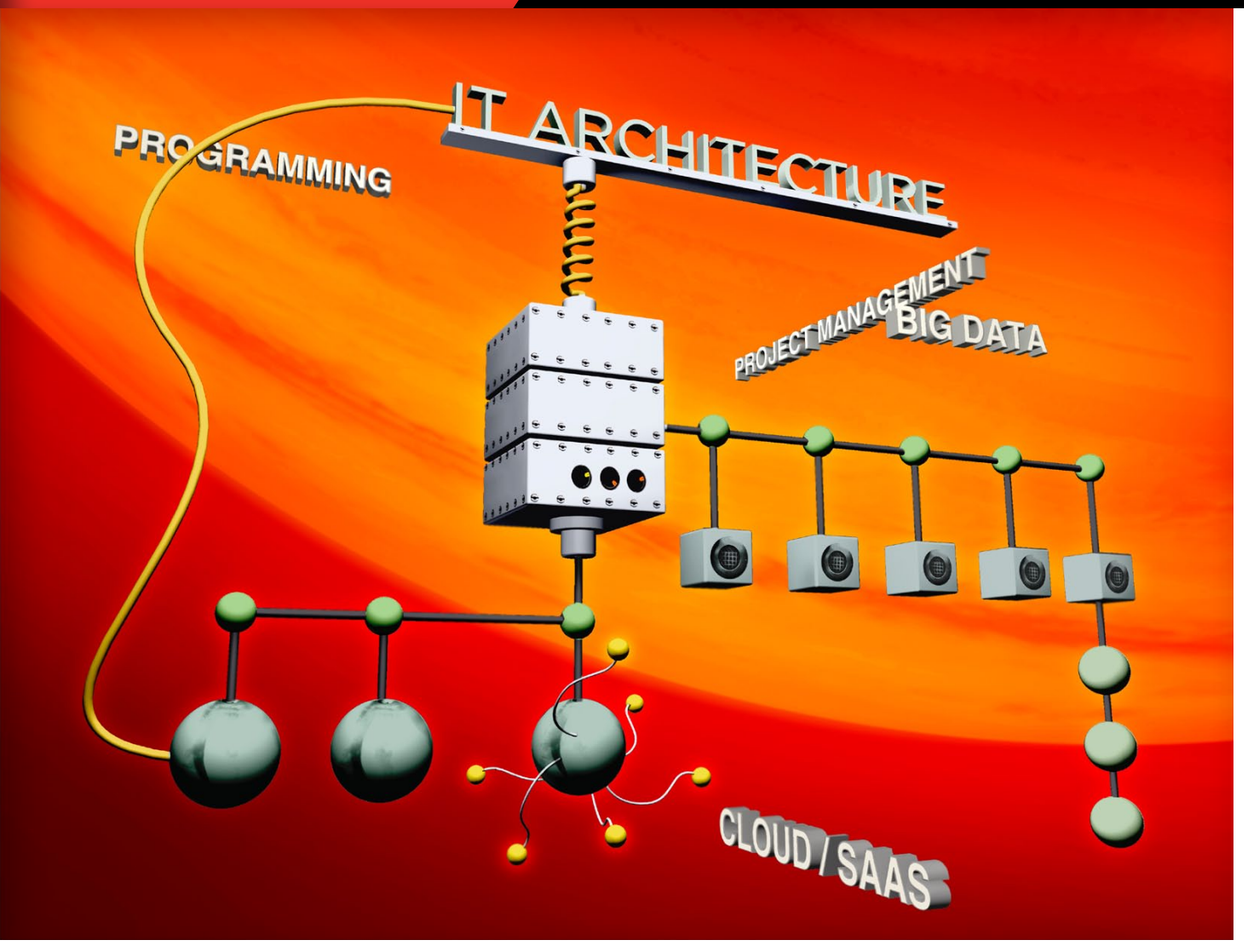
"This peer-to-peer meeting between Darren and other senior leaders has made a big difference in their commitment [to security]," says information management program integration director Hortense Nelson. "That personal element is very important."

Beyond internal communication, IT leaders like the manufacturing company CIO find themselves increasingly working outside the company's walls — with supply chain partners and their boards, in his case. The CIO has drafted a security questionnaire that he is proposing be added as a regular part of the vendor management process.

Dave Cooke, director of technology at Altum, a Reston, Va., consulting firm and software-as-a-service provider, has been on the receiving end of such questionnaires and says he is seeing an increase in their use by client companies. Altum's customers are large foundations and other organizations that give out grants and use Altum's grant-tracking software service to monitor distributions and how recipients are using funds.

"When we get a client that wants to sign up for our service, they send us a security software questionnaire. We have to answer a litany of questions before they consider us," says Cooke. "We've seen an uptick of these in the last 18 months. They help us because we figure if they're asking these questions, we need to take the same [issues] into account."

— JULIA KING



10 HOTTEST TECH SKILLS for 2016

Gunning for a banner year in IT? Make sure you have these skills in your toolbox.

BY MARY K. PRATT

THE IT TEAM at HRHCare has seen its workload rise in recent years, as the Beacon, N.Y.-based nonprofit has added facilities and expanded its services.

Eric Brosius, the organization's vice president of technology services, wants to expand the staff so his team will be able to cope with the added responsibilities and tackle new technology initiatives.

Specifically, Brosius says he wants to add another six or seven full-time people to his staff of 17 full-timers. His first hiring priority: two tech support folks. Then he wants to hire someone with architecture skills and experience working with software-as-a-service and cloud-based offerings to guide operations as the organization moves out of its own data center into a colocation site.

Eric Brosius plans to hire six or seven full-timers at HRHCare.

The results of *Computerworld*'s Forecast 2016 survey suggest that Brosius will face stiff competition for top talent when he goes to recruit people: 37% of the 182 IT professionals who responded to the survey said they likewise plan to increase head count in the upcoming year — that's a significant jump from last year, when only 24% said they planned to add new staff. Moreover, 24% of those polled this year listed "attracting new talent" as first among their business priorities for the next 12 months.

Complicating the recruiting challenge for Brosius is the fact

RICHARD BORGE ILLUSTRATION

HOT SKILLS IN A HOT MARKET

Top 15 skills *respondents plan to hire for in the next 12 months:*

IT architecture	42%
Programming/application development	40%
Project management	39%
Big data	36%
Business intelligence/analytics	34%
Help desk/technical support	30%
Database administration	25%
Security/compliance/governance	25%
Cloud/SaaS	25%
Web development	24%
Mobile applications and device management	22%
Networking	18%
Business strategy	16%
Vendor management	16%
Virtualization	13%

Base: 67 respondents who expect to increase IT head count in the next 12 months.

Source: *Computerworld* Forecast 2016 survey of 182 IT professionals.

that he's looking for people with three of the 10 skills most in demand among survey respondents who plan to hire new employees in the next 12 months: IT architecture, tech support and cloud computing.

John Reed, senior executive director of IT staffing firm Robert Half Technology, confirms that hiring managers could be facing a challenging year. "The market has been really strong, and we're expecting it will stay that way for the foreseeable future," he says. "I don't think you'll see explosive growth, but you'll see single-digit growth in demand, consistent with what we've seen over the past few years."

How to cope? Companies will need a comprehensive recruiting strategy in order to bring in great workers. They'll also need to put a lot of effort into retention so they won't have their best people walking out as new hires are walking in, Reed says. "If you have that two-pronged approach, you're probably going to be OK," he says. "You're certainly going to do better than most."

IT job seekers, on the other hand, are sitting pretty heading into 2016, Reed says, because salaries rise when demand for talent exceeds the supply of qualified professionals. Robert Half Technology is projecting a better than 5% increase in IT salaries for the next year.

Ready to dive into the 2016 job market? Here are the 10 skills on track to be most in demand, according to IT pros who participated in *Computerworld*'s Forecast 2016 survey.

1 IT Architecture

- **42% of respondents** with hiring plans said they will be seeking people with this skill in the next 12 months.
- **New to the list this year.**

The top 10 list starts off with a surprise. Although IT architecture is a fundamental area of expertise for techies at all levels and in various roles, it rarely makes anyone's list of hot skills.

The term "IT architect" encompasses a wide range of

> **Technology touches everything today, and programmers and developers — they're the ones who make things go.**
>
> JASON HAYMAN, RESEARCH MANAGER, TEKSYSTEMS

specialists, from enterprise architects to cloud architects, so recruiters say it makes sense that IT architecture expertise is in demand as companies move forward with all sorts of technology-driven projects.

Michael J. Sylvester II, CIO for the Los Angeles County Department of Public Social Services, manages about 400 staff members and another 500 or so IT contractors. He says that mix includes a lot of people with strong IT architecture talent but adds that "we still look for people with a firm grasp of enterprise architecture. We want those folks to look at industry standards and frameworks, and to set those up so we can have uniformity."

Sylvester says he wants IT architecture professionals with technical chops who have progressed from deep technical positions into more managerial roles so they can lead teams tasked with driving IT projects forward.

Many organizations are seeking a similar mix — professionals coming from sysadmin, engineering and senior engineering roles, says Tyler Mikkelson, a recruiting team lead for the Los Angeles office of Mondo, an IT recruiting firm.

"They're gifted technically [and] they have strong business acumen, so they can speak to executives and C-suite individuals," he says.

2 Programming/ Application Development

- **40% of respondents** with hiring plans said they will be seeking people with this skill in the next 12 months.
- **Last year's ranking:** No. 1

Despite fears that programming expertise is a commodity that can be obtained cheaply offshore, programming and application development continue to be among the most sought-after skills in enterprise IT.

"Technology touches everything today, and programmers and developers — they're the ones who make things go," says Jason Hayman, research manager with TEKsystems, an IT staffing, talent management and services firm.

Demand for programmers and developers is springing up in new areas, too, thanks to the rise of mobile and the emergence of the Internet of Things. Hayman points to the fact that some cars now come off the assembly line with a million lines of code as just one example of how programming's footprint is widening.

3 Project Management

- **39% of respondents** with hiring plans said

they will be seeking people with this skill in the next 12 months.

■ **Last year's ranking:** No. 2

With almost half (46%) of Forecast survey respondents expecting their technology spending to increase in 2016, it's no surprise that project management remains a top five skill: More spending means more projects—and that means more people will be needed to manage those projects.

Ken Grady, CIO at IDEXX Laboratories, a pet healthcare diagnostics company headquartered in Westbrook, Maine, has about a dozen openings within his 250-member IT department, and he plans to add new positions in the upcoming year. His hiring plans include bringing on two or three project managers to join the roughly 15 project managers already working in his newly created project management office.

Grady says he wants people who can help his teams work within an agile and DevOps environment, as well as professionals who can manage diverse teams and negotiate priorities, scope, deliverables and expectations with various stakeholders.

"It's not a new skill, but the difference now is the way we iterate. The execution is much faster," Grady explains. "So it takes a bit more finesse in expectation management and bringing people together. I'm looking for people who have the comfort with that pace and that approach. It's as much fit as it is a particular skill set."

4 Big Data

■ **36% of respondents** with hiring plans said they will be seeking people with this skill in the next 12 months.

■ **Last year's ranking:** No. 10

The surge in interest in using data to drive business has pushed demand for big data skills from No. 10 in last year's *Computerworld* Forecast report to No. 4 today.

Moreover, in the Forecast 2016 survey, big data/analytics was No. 1 on the list of technologies that survey respondents said they were currently beta-testing or using in pilot projects, with 23% saying they were engaged in such initiatives.

When it comes to big data initiatives, "companies are typically looking for someone who can help them manage data and package that data," says Reed, of Robert Half Technology. "[They want] people who can interpret and then help bring that data to life visually—building dashboards and things of that nature, so the executive suite can push through techspeak and understand what the data is telling them."

5 Business Intelligence/ Analytics

■ **34% of respondents** with hiring plans said they will be seeking people with this skill in the next 12 months.

■ **Last year's ranking:** No. 7

Holding steady in the top 10 skills list is another data-related area of specialization: BI and analytics.

Jeff Remis, a manager at IT staffing and recruiting firm Addison Group, says demand for IT professionals with these skills is strong, particularly in healthcare, insurance, financial services and retail—industries where the use of BI and analytics is more mature than it is in other sectors.

Remis says hiring managers are looking for recruits with technical expertise, but they also want BI specialists who

understand the business and the industry.

Such requirements put a premium on good candidates.

6 Help Desk/ Technical Support

■ **30% of respondents** with hiring plans said they will be seeking people with this skill in the next 12 months.

■ **Last year's ranking:** No. 3

Brosius says hiring Tier 1 and Tier 2 support people is a priority at HRHCare, where organizational growth has resulted in burgeoning technology needs. But he acknowledges that competition for talent is tough, so he says he looks for potential as much as experience when evaluating job applicants.

"My recruiting model is to find prospects, people recently graduated from college. I feel they have a well-rounded education, and it gives me confidence that they can communicate and have good customer service skills," he says. "We can educate them on the tech skills, but you can't teach personality."

7 Database Administration

■ **25% of respondents** with hiring plans said they will be seeking people with this skill in the next 12 months.

■ **Last year's ranking:** No. 6

Demand for database administrators remains high thanks to the ever-increasing interest in big data, BI and analytics.

In its 2016 Salary Guide, Robert Half Technology lists database administrator as one of the most in-demand specialties, noting that "more companies are using big data analytics to help inform business decisions and are relying on specialized personnel for managing and interpreting raw data."

> **My recruiting model is to find prospects, people recently graduated from college. I feel they have a well-rounded education, and it gives me confidence that they can communicate.**
>
> **ERIC BROSIUS**, VICE PRESIDENT OF TECHNOLOGY SERVICES, HRHCARE

The guide also states that salaries for database administration positions will rise by 4% to 9% next year, with pay ranging from about $100,000 to $200,000.

Recruiters say employers want people with extensive backgrounds in database administration and a deep understanding of data reporting tools and technologies such as Oracle, SQL, DB2 and Hadoop.

8 Security/ Compliance/ Governance

■ **25% of respondents** with hiring plans said they will be seeking people with this skill in the next 12 months.

■ **Last year's ranking:** No. 4

Although security expertise slipped from No. 4 on last year's list of the 10 hottest tech skills, make no mistake about its importance: Security professionals are in demand and can command high salaries. Exactly 50% of the IT professionals who participated in our Forecast 2016 survey said they plan to increase spending on security technologies in the next 12

months, and security was No. 2 among the most important IT projects that respondents have underway (see "Security Takes Center Stage," page 23).

Compensation for security pros keeps going up because demand for talented people is strong, and because security specialists play a critical role in most organizations. According to Robert Half Technology's 2016 Salary Guide, salaries in the security field will rise about 5% to 7% next year, ranging from $100,000 on up to nearly $200,000 on average.

ACCORDING TO ROBERT HALF TECHNOLOGY, SECURITY SALARIES WILL RISE

5%-7%

NEXT YEAR, RANGING FROM $100,000 ON UP TO NEARLY $200,000 ON AVERAGE.

9 Cloud/SaaS

■ **25% of respondents** with hiring plans said they will be seeking people with this skill in the next 12 months.

■ **Last year's ranking:** No. 12

Andrew Ho is the new vice president of technology at Global Strategy Group (GSG). At the moment, he's both the top and only IT staffer at the public relations and research firm, which has 90 employees in four U.S. offices. He wants to add someone with experience in cloud computing and software as a service.

Ho says GSG has made a significant investment in Salesforce tools, and he wants someone who can ensure that the firm is getting its money's worth from that technology and any cloud offerings it uses in the future.

"We bought ourselves a Ferrari, but we haven't figured out how to get it out of first or second gear. There's so much more we can do with it," Ho says of Salesforce, noting that many companies face that challenge with other cloud-based systems as well.

Others are following his lead, as the cloud continues to reshape enterprise IT. Research firm IDC predicts that more than half of enterprise IT infrastructure and software investments will be cloud-based by 2018. Specifically, spending on public cloud services will grow to more than $127 billion by 2018, according to an IDC forecast report.

10 Web Development

■ **24% of respondents** with hiring plans said they will be seeking people with this skill in the next 12 months.

■ **Last year's ranking:** No. 5

Web development continues to crack the *Computerworld* Forecast list of the top 10 most in-demand IT skills because organizations have come to rely heavily on the Web as a channel for connecting with customers, clients, partners and employees since they built their first websites a decade or two ago, IT leaders say.

While they don't need Web developers to establish a Web presence anymore, they do need people with the ability to ensure that their sites are open and ready for business.

"One of the main categories where we're seeing double-digit growth is in Web development," says Reed, of Robert Half Technology. "Companies want [to ensure] they have a website that's mobile-friendly, that's easy to navigate, and that showcases other products and services so it drives incremental sales." ◆

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Security Manager's

Journal

Money Talks When You Need to Get Things Done

Two security initiatives will languish if staffers have no incentive to work on them. Solution? Tie them to bonus pay.

BY MATHIAS THURMAN

FOR SEVERAL MONTHS NOW, I have been proactively identifying risks and vulnerabilities within my organization.

Some were easy to fix—I just had to write some new policies, convince our facilities department to issue picture ID badges or replace our firewalls.

Others require some heavy lifting and I won't be able to handle them alone, but it can be tough to persuade colleagues to work on security initiatives, especially in a small company with a tiny security staff.

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One potential security weakness that I want to address but that I can't do on my own involves the architecture of our application programming interface. Our API architecture was developed more than 10 years ago and was never modernized. When a user wants to write an API to help a customer interact with our application, we issue two user IDs and passwords. One credential is used to access a shared API gateway; the other is used to access the specific customer's data.

Maybe requiring two different passwords seemed like a strong security measure a decade ago, but it doesn't impress me today. Passwords can be compromised.

A more secure and modern method for allowing API access is to use OAuth, an open standard that uses access tokens issued by an authorization server. Moving to OAuth will require a great deal of engineering, but even more daunting is the amount of change management that's required. We will have to retrofit everyone in our customer base that is currently using the legacy API and change all sorts of documentation and enablement processes.

All in all, it's a huge effort.

Security Checkup

I also want to roll out an application that will let customers, support personnel and other organizations assess the health of their security configurations. We offer several configuration options to our customers,

Trouble Ticket

At issue: Two important security initiatives can't be done without help from other departments, but no one has the time.

Action plan: Tie progress on those initiatives to managers' bonus pay.

including password complexity, session timeouts, lockout, multifactor authentication, single sign-on, and roles and permissions.

A health check application would enable our customers to identify both weaknesses and opportunities to enhance security. Our support organization could use it to encourage customers to enhance security controls.

Calling All Teams

So a strong case can be made for developing such an application. But like the issue with our API architecture, it will require a lot of work from many teams, such as product management, engineering and support.

The problem, of course, is that those folks are all focused on daily operational activities and other priorities identified by management.

The good news is that the executive team has given me their blessing to pursue both of those initiatives. But that isn't the same as allocating the resources necessary to successfully complete the projects. So how are we going to get them done?

Well, if the problem is that the people I need to contribute to these projects have no incentive to do so, then we need to give them an incentive. The tool available to do this is bonus payouts. The company measures performance by determining how well employees have met the various objectives laid out in their performance reviews. Progress (or lack of progress) in meeting those objectives helps determine how large each employee's bonus will be.

I talked upper management into creating two objectives for key managers within the product management, support and engineering departments: "Develop a plan to modernize API architecture" and "Identify requirements for a security health check application." They're in my objectives as well.

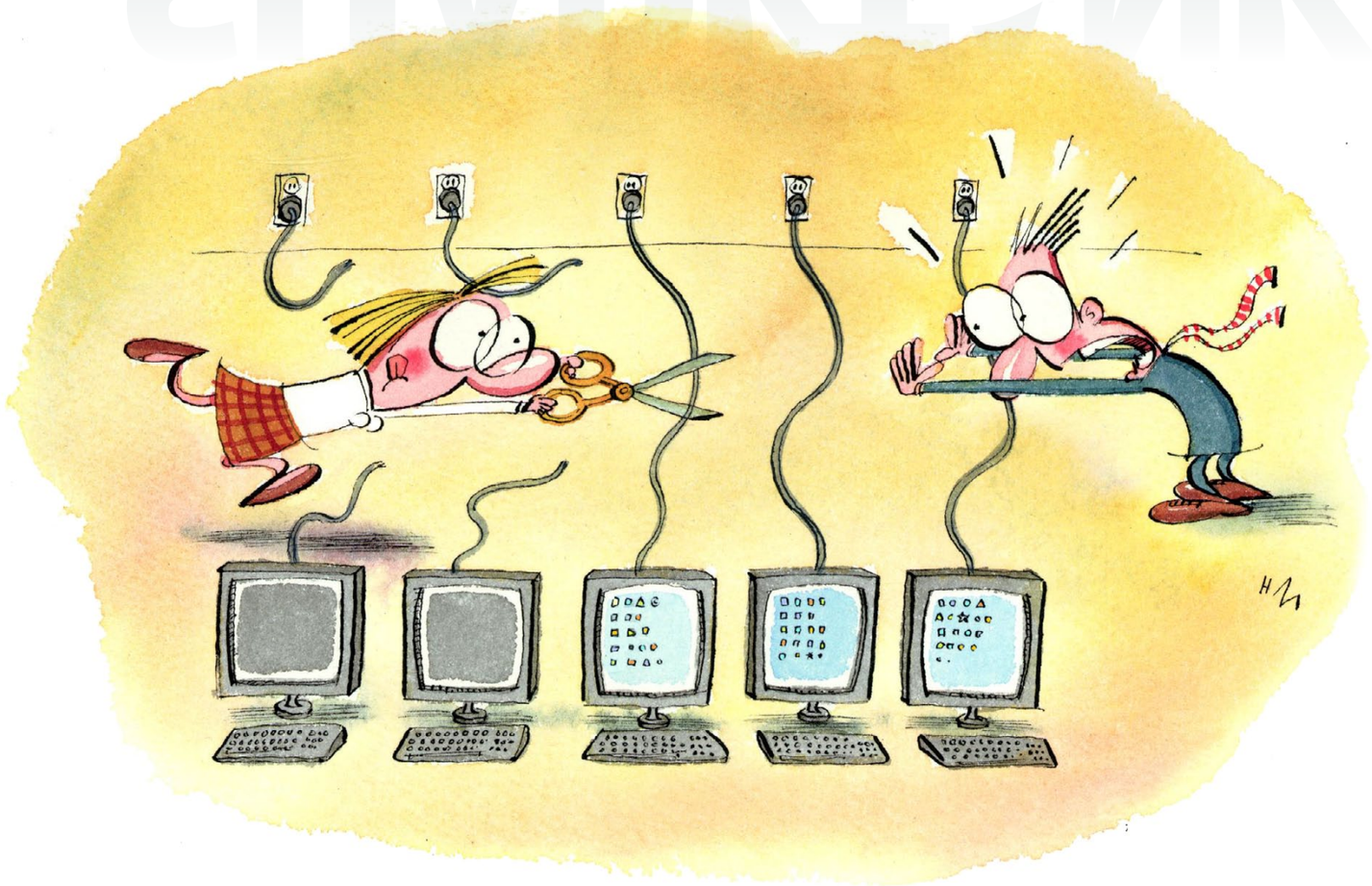
Now we all have a vested interest in completing these projects. Next quarter, I'll expand the objectives to move the initiatives along, and so on until completion. It may take several quarters to complete both projects, but it'll be worth it. ◆

This week's journal is written by a real security manager, **"MATHIAS THURMAN,"** *whose name and employer have been disguised for obvious reasons. Contact him at mathias_thurman@yahoo.com.*

It can be tough to persuade colleagues to work on security initiatives, especially in a small company with a tiny security staff.

SHARK TANK

TRUE TALES OF IT LIFE AS TOLD TO SHARKY



But It Works at Home

THIS PILOT FISH'S SON works as a physical therapy aide while studying computer science. "He was talking with his boss when an older physical therapist walked in and started unplugging the computers," says fish. "One by one the screens went black. Once the shock wore off, my son jumped up and prevented her from unplugging PC number four. He then asked her why she was unplugging the computers. Her response: 'My computer is running slow, and I know that if I unplug enough computers, my computer will get faster.' As she went back to her PC to continue typing patient notes into Word, my son's boss told him to follow her to make sure she didn't try to increase her computer speed in any other offices, while he called IT and let them know what happened."

Oh, *That* Phone!

User complains that she keeps getting locked out of her account — and this pilot fish is pretty sure he knows why. "From experience we know this is usu-

HAL MAYFORTH ILLUSTRATION

The outside consultant brought in to help with the Exchange upgrade notices the failed login attempts are coming from a mobile device using the Outlook Web app, with an IP address that's not on the company network.

ally a smartphone that is trying to check email with an old password after the user has changed their password," says fish. "The user assures us that she has changed the password on her iPhone and that they both match. Still, the user account is locking out every 15 minutes." And after a week of troubleshooting, upgrading and rebooting Exchange, the account still locks her out multiple times a day. Then the outside consultant brought in to help with the Exchange upgrade notices the failed login attempts are coming from a mobile device using the Outlook Web app, with an IP address that's not on the company network — it belongs to AT&T, the user's mobile provider. Grumbles fish, "It's only then that she tells us, 'Oh yeah, I have an old Android phone at home that I use just as a backup.' Turns out that phone has an active sync account on it and has been attempting to check her corporate email account."

No Good Password Goes Unpunished

Consultant pilot fish is paying his bills online, but for some reason his health insurance company's website won't let him log in, so he calls the support number. Is there a known issue on your system, or is there a problem with my account? he asks the support rep. There *is* an issue that might be causing the problem, support rep says. It seems that at the start of the month, security was switched from supporting passwords of six to eight characters to supporting passwords that were up to 15 characters, and customers with the longer passwords were now having problems. "Try logging in with just the first eight characters," rep says. Sighs fish, "I tried it. It worked. They had been throwing away anything in a password beyond eight characters — and then after the security upgrade, the people who had longer, better passwords were the ones who were punished for it." ◆

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IT and the Entrepreneurial Age

TAKE NOTE: IT can create, or it can destroy, an organization's ability to be entrepreneurial.

If your IT organization isn't nurturing entrepreneurship, you're in trouble. The age of entrepreneurship is upon us. The enterprise — the *entire* enterprise — has to become entrepreneurial, meaning that it has to proactively adapt to rapidly changing circumstances.

The world is experiencing exponential change. The futurists at Singularity University, an institution devoted to expanding our capability of coping with that very thing, believe that from this day forward, the change we experience every five years will be equal to what previously filled 100 years. Also expanding at a fearsome rate is the amount of data we collect. Dan Geer, the chief information security officer at In-Q-tel, finds it plausible that the compound annual growth rate for new data is now 57%. That certainly sounds big — and abstract. So think of it this way: Every 120 seconds, 50,000 Libraries of Congress full of additional information will be created. Data growth and the rate of change go hand in hand. Every second, there is more to know. Every day, something that once was impossible or prohibitively expensive becomes possible and affordable.

The question for you to grapple with is how you can wrest what you need from so much change and all those mountains of data. The answer doesn't come easily. As GE CEO Jeff Immelt once said, "The book that can help you has not been written yet." There are people you can learn from, but no one, not even Google, Apple, Facebook or Amazon, has figured out how to sustainably play the exponential strategy game. Your organization is probably going to need someone whose job it is to do that; some strategic thinkers argue that the enterprise needs a new CEO — a chief entrepreneurship officer.

The reason that is not a crazy idea is that what we are in for is not a period of "punctuated equilibrium"—a brief moment of fundamental change followed by a return to stability—but perpetual disequilibrium. Enterprises are going to have to figure out how to make money (and nonprofit organizations are going to have to figure out how to fulfill their missions) under conditions of massive and continuing uncertainty. The cognitive exercise of determining which opportunities to pursue when the entire landscape is shifting is what I call "exponential which-craft."

Innovation—the conversion of ideas into cash—is at an all-time high. Today, if you want to be hired as a C-level executive in a major global enterprise, you are going to have to be capable of delivering high-growth and high-margin revenue streams. In short, you are going to have to be entrepreneurial.

Many people have the idea that you have to be young, or a software developer, or an inhabitant of Silicon Valley to be an entrepreneur. None of that matters, though. You just have to have an entrepreneurial mindset. Sure, the person behind the next big app might be a young software developer in the Valley, but that's not the sum total of what makes an entrepreneur. Remember Harland David Sanders? He was 62 and living in North Corbin, Ky., when he franchised his first Kentucky Fried Chicken restaurant.

So what exactly is the entrepreneurial mindset? It exists between two poles, which you can think of as little "e" entrepreneurs and big "E" entrepreneurs. Little "e" entrepreneurs start, own and operate small businesses. When you hear statistics regarding entrepreneurship—number of businesses formed, number of workers employed—you are typically hearing data about little "e" entrepreneurship. That's why, in global surveys, Egypt is classified as being more entrepreneurial than the U.S.; it has a whole lot of small-shop owners.

Big "E" entrepreneurs create new industries, disrupt existing industries and assault the status quo. For the longest time, IT has hitched its wagon to little "e" entrepreneurs. In the very near future, IT shops will become driven by the vision of being in service to big "E" entrepreneurs. Get ready. ◆

You don't have to be a young Silicon Valley software developer to be an entrepreneur. You just have to have an entrepreneurial mindset.