ERP heads for the CLOUD

Cloud-based ERP will eventually rule, and on-premises software is destined for legacy status. How can IT ensure a smooth transition?

BY MICHAEL NADEAU
E R P  h e a d s  f o r  t h e  c l o u d

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By Michael Nadeau
The year of cloud ERP

One of the advantages of being a grizzled technology writer and editor (trust me, there aren’t many) is that I carry a bit of historical perspective. I’ve witnessed, for example, “The Year of Mobile,” and “The Year of the Cloud” for, well . . . many years.

Part of my perspective includes several years as the editor of ASPnews. ASP, in this case, stood for “application service provider” (not to be confused with active server pages), and it was the term du jour for many years. In the early 2000s, we were writing about two types of ASPs. The first was web-enabled applications, or hosted versions of on-premises software, an early iteration of hybrid cloud. The second was a new breed of web-native — a.k.a. software-as-a-service (SaaS) — apps.

A lot of those SaaS apps have since been swallowed by bigger fish or have faded away (as has ASPnews). But back then, our monthly ASPnews ratings — the “ASPnews Top 50” — included many apps from what at the time were noteworthy startups, many of which are well-known brands today, including Concur, NetSuite (NetLedger back then), Salesforce.com and WebEx.

Functions such as CRM, collaboration, web analytics and expense management were all well represented in the early years of SaaS. ERP? Not so much.

That’s not surprising. ERP software is complex, expensive and, by definition, far-reaching throughout the enterprise. As Michael Nadeau (another veteran tech journalist) writes in this month’s cover story, “ERP Heads for the Cloud,” on-premises ERP implementations are living on borrowed time. “This is a big change from just a few years ago, when cloud ERP was met with skepticism, particularly among larger companies with big investments in on-premises systems. Attitudes have changed as IT and business management have come to understand the cloud’s capabilities and value proposition,” Nadeau writes.

Gartner agrees, predicting that the cloud will become the default mode of software deployment by 2020. “The now well-established stance of cloud-first in software . . . is gradually being augmented or replaced by cloud-only,” the research firm says.

Go cloud or go home

This may be a case of business users and vendors moving in the same direction, according to Nadeau. With the promise of tighter integration between analytics, social media, IoT devices and applications, it only makes sense that companies such as Oracle, SAP and Microsoft feel just as strongly as their customers about cloud-first. Meanwhile, cloud-native ERP vendors are poised to offer formidable challenges.

The cloud and ERP are finally a match. Vendors and enterprises both appear to understand that, which is good, because those that don’t will be at a competitive disadvantage.

— Dan Muse, editor in chief, CIO.com
Everything’s a platform now

Enterprise IT is rife with buzzwords that put a name to technology trends — often when they’re still just a gleam in the eye. The media, analysts and vendors alike are guilty of fanning the flames by coming up with new buzzwords when the current cadre loses steam.

That’s not to say that these technologies don’t have real value. The cloud, big data, consumerization, BYOD and, more recently, digital transformation all started as little more than hype. But today the cloud is seen as a viable, if not the de facto, way of doing business. I would argue that the consumerization of IT and the bring-your-own-device trends gave rise to the digital transformation many enterprises are now working toward. And first-generation big data initiatives are paying off.

The latest buzzword I’m hearing is platform — a term that’s being thrown around by enterprise software startups to describe their products. It seems there’s more prestige in being a platform than there is in being a great application.

I saw this firsthand at series of CIO Dinners I hosted with a hot Silicon Valley startup — one that has attained the vaunted status of unicorn, valued at more than $1 billion. The company is trying to position its offering as a platform so enterprise IT leaders will consider using it to build additional applications, rather than simply using it as a feature-rich application on its own. It treated the dinners as in-front-of-the-glass focus group sessions.

A matter of semantics?

I think the API economy is muddying the waters on the platform vs. application discussion. Many startups are building their software on open technologies and are looking to broker relationships with other software players, via APIs, to strengthen their products. But does opening up your software to APIs make it a platform? Or is it just a feature-rich application?

This issue has even made its way into mainstream entertainment. One of the key themes of Season 3 of HBO’s hit show Silicon Valley was startup Pied Piper trying to position its offering as a platform instead of a “box” that’s plugged into the data center. We learn that Pied Piper’s CEO, Richard Hendricks, will go to great lengths to ensure that it is considered a platform, thus making it more valuable in the minds of users and investors — and more prestigious for top developers to work on.

It remains to be seen how many of today’s startups will fare: Will their systems be platforms, applications, boxes? Will they be acquired so their applications can strengthen other vendors’ platforms, or will they just fizzle out?

I can tell you that at the many dinners I hosted with my client, not one IT exec viewed the startup’s technology as a platform. But I don’t think they held that against them either.

— Adam Dennison, SVP and publisher, CIO.com
(adennison@idgenterprise.com)
At Travelers, drones could get risky jobs

The insurer hopes to use drones to assess damage in perilous places, but regulations still stand in the way of widespread use of unmanned aircraft.

BY CLINT BOULTON

The sound of a thousand angry hornets rings off of concrete and metal as the drone rises — 10, 20 and finally 30 feet in the air and over the office building. Its camera eye searches for roof damage that it can stream to a flat-screen TV on the ground.

The demonstration, conducted in a cavernous lab run by Travelers, was a snapshot of how the insurer hopes to one day assess damage to roofs with inclines more suited for mountain goats than humans. Significant hurdles impede widespread adoption, but drones could prove to be particularly useful for surveying damage caused by tornadoes, hurricanes and floods.

Today, insurers pay third-party contractors to climb steep roofs and assess damage, Patrick Gee, Travelers senior vice president of claims, told CIO.com during a visit to the company’s Claim University, a sprawling facility in Windsor, Conn., where 7,000 employees go for training each year.

But using drones equipped with cameras, many of which have crystal-clear
1080p or even 4K resolution, can save Travelers time and money as well as reduce the risk of injury. “We’d love not to have people up on roofs for safety purposes,” Gee says. “It’s much safer to be able to do it with a drone and do it from the ground.”

The ups and downs of drones
Travelers isn’t alone in its bid to use drones in damage assessments. Liberty Mutual Insurance, State Farm and American Family Insurance are all testing the machines or using them in limited instances. Jeff Haner, a Gartner analyst who tracks the insurance sector, said drone use will give insurance CIOs new opportunities to provide IT support for underwriting and claims-handling.

Yet proposed regulations could limit commercial drone use. The Federal Aviation Administration (FAA) wants to require companies that plan to operate drones commercially to have pilots obtain “airworthiness certification.” Moreover, pilots using video screens are advised to have “spotters” — people who won’t take their eyes off of the drones — so the pilots can focus on taking photos. And in what Gee says is the biggest obstacle, the FAA also prohibits unmanned aerial vehicles from venturing within 500 feet of any person or building.

Haner says the potential for drones to significantly improve key insurance operations “will not be fully realized in the U.S. until regulatory challenges are resolved.”

But Gee remains optimistic, insisting that drone use will “vastly expedite damage assessments down the road.”

In the meantime, Travelers will continue testing drones. Gee says he has gone to Washington to try to persuade the FAA and other parties that drone use would be a vital part of Travelers’ business. “We’re having a lot of conversations to help move the process along so we can use [drones] cost-effectively,” he says.

Satellites and social media
Drones are just one of the high-tech tools Travelers uses.

Agents also use satellite imagery and geospatial software to create color-coded maps illustrating the effects of hail storms, tornadoes and floods.

And to gauge the extent of natural disasters in areas where it has a lot of customers, Travelers uses a social media dashboard to collect damage photos from Twitter, Facebook and other public sources. “We can put together a picture of how damaging [a catastrophe] was before getting physical access to the site,” Gee says.

Gee says Travelers CIO Madelyn Lankton provides the tools, including a claims platform, geospatial software and other technologies to support the effort. “Ninety-eight percent of what we do is driven through an IT process that Madeline’s department is building for us,” Gee says.

Travelers also sees smart home technologies and the internet of things as having the potential to change the insurance business. For example, insurers could offer discounts to homeowners who install smart locks, appliances and plumbing and electrical equipment. The company is particularly interested in smart water shut-off valves, which can prevent damage by automatically killing water flow when pipes burst.

As Gee says, connected devices can “keep the unexpected from happening.”

Clint Boulton is a senior writer at CIO.com.
Cloud-based ERP will eventually rule, and on-premises software is destined for legacy status. How can IT ensure a smooth transition?

BY MICHAEL NADEAU

The cloud is making on-premises ERP implementations an endangered species. This is a big change from just a few years ago, when cloud ERP was met with skepticism, particularly among large companies with big investments in on-premises systems. Attitudes have changed as IT and business management have come to understand the cloud’s capabilities and value proposition.

Cloud-based ERP platforms rely on hosted internet services, rather than ERP heads for the CLOUD
an on-premises networked server infrastructure, to deploy core enterprise systems such as financial applications, human resources (HR) tools and supply chain management (SCM) software. The original advantages of cloud ERP were faster deployments, immediate enterprise-wide availability of the latest versions of applications, less need for on-site support and simpler pricing. Later systems featured greater ease of use, mobile-enablement of applications and easier integration with outside data sources. Today, the most up-to-date cloud-based ERP systems have internet of things (IoT) and machine learning capabilities.

With cloud-based ERP offering so many pluses, why even consider an on-premises option? Even market leaders SAP and Oracle admit that few companies are deploying new on-premises ERP systems.

Research firm Gartner predicts that the cloud will become the default option for software deployment by 2020. The writing is on the wall: Cloud will rule, and on-premises ERP is heading for legacy status.

Changing ERP attitudes

Two barriers to cloud ERP adoption had been security concerns and resistance to change among IT leaders. The latter is understandable, considering the investment made in the software, training and support infrastructure of on-site systems, not to mention the risk associated with replacing any core business system. The security concerns were tied to the belief that remotely hosted systems were inherently at greater risk than on-site deployments — especially if they were housed in multi-tenant public cloud setups where a single instance of application code serves many customers.

Those areas of cloud’s perceived weakness are now seen as strengths. For example, with on-site IT infrastructures, security degrades over time as upgrades are skipped and new software with additional risks is integrated. With cloud-based ERP, the latest security updates are always deployed, and it’s easier to maintain the integration points to keep up with security for apps outside the core system. “Security seems to have been solved,” says David Linthicum, senior vice president at consultancy Cloud Technology Partners. “The sky hasn’t fallen.”

While IT teams might get attached to systems they know, they hate the constant update/upgrade cycles, the database maintenance, the training requirements and the customization needed to keep them running. For example, Oracle customer HSBC opted to move to the cloud when it was looking at an 18-to-20-month upgrade project for its on-premises ERP deployment, says Rondy Ng, senior vice president of applications development at Oracle. In contrast to a year-and-a-half upgrade, the cloud migration took about six months: “They started [with their cloud implementation] in October last year and went live with Oracle ERP Cloud applications in April,” Ng says.

Cloud ERP “lets you redirect IT
to value-add activities,” says Gartner analyst Mike Guay. “Even if you adopt cloud ERP to redirect IT resources, if you don’t replace everything with cloud, someone still has to manage the infrastructure remaining.”

The ease of scaling cloud-based systems has won over many companies, especially those looking to drive growth with their first ERP systems. “Capabilities like usage-based billing, elasticity and self-provisioning allow companies to grow without a lot of pain,” says Linthicum. This has expanded the market for ERP. Companies that have never had an ERP system before are now implementing them at a rapid rate. Oracle, for example, reports that half of its nearly 2,600 Oracle ERP Cloud customers are new, many of them smaller, growing companies.

One of those companies is The Rancon Group, a Southern California real estate business. “We had an outdated accounting system and could ever do on our own,” says Van Houten. Rancon supports its Oracle system internally with two power users, so it hasn’t had to add support staff. An Oracle partner and Oracle itself provide additional support when needed. Now Rancon is looking to move other manual processes to the cloud.

“[Cloud ERP] lets you redirect IT to value-add activities.”

— MIKE GUAY, ANALYST, GARTNER

Vendor strategies and customer options

Cloud ERP vendors generally fall into one of two categories: Cloud natives, such as Workday and NetSuite, whose systems were developed for the cloud from the start, and traditional ERP vendors like Oracle, SAP, Infor and Microsoft, which have developed cloud offerings and whose products offer continuity and familiarity to their existing on-premises customers and appeal to new users who want to deploy in the cloud. SAP has hedged its bets by acquiring cloud ERP natives SuccessFactors and Ariba, and Oracle has announced plans to buy NetSuite for $9.3 billion.

A key difference between cloud natives and traditional vendors is in the infrastructure used to support and deliver the services. Cloud natives rely on third-party cloud infrastructure providers such as Amazon Web Services (AWS) or Microsoft. Traditional vendors mostly develop their own cloud infrastructures; the exception is Infor, which partnered with AWS. “Oracle and SAP have complete control of their stack,” says Guay. This allows them to better optimize
performance, but Guay wonders how that model will scale as cloud customers start to outnumber users of on-premises systems. “Will they be able to support [that many customers]? How bumpy will the road look?” he asks. He says he expects those vendors to master the learning curve, but adds that they may have to consider outsourcing to an infrastructure partner.

**Cloud natives branch out**

Until recently, it was hard to find Fortune 500 companies that had moved core business processes to cloud-native services, which they considered limited and untested. The idea that cloud-native systems had limited capabilities arose from the fact that the vendors typically started by focusing on a single type of application, often financial systems or HR tools, and then slowly built out their suites.

“When companies like Chiquita and Flextronics signed up [for cloud-native Workday], it turned people’s heads,” says Dan Beck, senior vice-president for product marketing and technology strategy at Workday, whose customers now include Bank of America, Unilever and AstraZeneca.

Workday started with an HR tool that it offered through a software-as-a-service (SaaS) model, and then moved into financials. It has added new point solutions to that core and has been developing industry-specific options.

Most Workday customers use the company’s HR application. They can start with core HR or financial systems and layer on point solutions such as recruiting or planning tools, Beck explains. As they add more Workday functionality, they can shut off redundant on-premises systems.

AstraZeneca, for example, replaced its outsourced HR system with Workday’s Human Capital Management product a year ago. The goal was to have a single global HR system for its 65,000 employees, according to David Smoley, global CIO at the pharmaceutical company. “There was too much pain [with the older system]. We had payroll issues, usability issues, processes we were not able to get to work,” he says. “We tried for a long time to put a fix in place.” At the root of the trouble was the outsourced system’s inability to handle all of the country-specific requirements that a multinational enterprise has to deal with. Each exception required customization of the system. Workday was able to meet those requirements. Smoley says that AstraZeneca felt confident going with Workday because “it was easy to find Workday customers of equal scale and global breadth.”

AstraZeneca’s approach is to evaluate cloud-based point solutions as business needs arise, but it will still consider on-premises options. “A lot of best-in-class tools happen to be cloud,” says Smoley. “That doesn’t mean all the best tools are in the cloud.”
Traditional ERP vendors have a dilemma in that they must continue to support their large bases of on-premises users while offering similar capabilities via the cloud. Moreover, their cloud products need to provide clear migration paths for existing customers in addition to standing on their own for new customers.

For new customers, traditional ERP vendors offer a greater scope of cloud-based offerings, particularly in what’s considered the core ERP application suite: financials, SCM, procurement, project management, enterprise performance management (EPM), and governance, risk and compliance (GRC). The challenge for them is to package their offerings in a way that’s digestible for companies of all sizes, across all industries.

SAP’s strategy is to offer three options: HANA Enterprise Cloud, cloud-native systems such as SuccessFactors and Ariba, and a platform-as-a-service (PaaS) offering called HANA Cloud Platform. HANA Enterprise Cloud is a managed cloud service that allows companies to move their existing SAP ERP systems to the cloud-enabled S/4 HANA application suite. The PaaS offering, HANA Cloud Platform, provides an infrastructure on which to build cloud applications. SAP also offers a version of S/4 HANA that’s scaled for small and midsize businesses, as well as industry-specific versions.

Oracle also has PaaS and SaaS offerings based on its infrastructure and ERP application suite. In an effort to accommodate customers of all sizes, the company takes a modular approach that makes it possible to scale its systems up or down without compromising functionality, according to Ng. For example, smaller companies might not need GRC or SCM functionality; they may start with, say,
“The cloud has always been hyped as cheaper, but that’s not always the case.” – DAVID LINTHICUM, SENIOR VICE PRESIDENT, CLOUD TECHNOLOGY PARTNERS

financials, procurement or project management tools and add more applications as they grow. “We’ve made it simple, creating rapid Oracle ERP Cloud implementation models for fast-growing companies,” says Ng, noting that Pandora deployed Oracle ERP Cloud with that approach.

Infor has chosen an industry-specific approach to the cloud, with offerings hosted on AWS infrastructure. “Many customers start small with sales or expense management,” says Lisa Pope, global head of cloud sales and strategy at Infor. “Then they quickly add two or three more apps, and then their core apps.” New customers, particularly small and midsize operations, tend to have all-cloud strategies.

In March, Microsoft released a product called Dynamix AX, which was designed for, and built on, its Azure cloud platform. Like other traditional ERP vendors, Microsoft offers industry-specific versions of its applications, but it seems to be focusing on the user and customer experience as its main selling points. That means emphasizing ease of use, mobile access and real-time intelligence capabilities on the front end and scalability, security and lower maintenance needs on the back end.

Traditional ERP vendors have developed a wide range of industry-specific on-premises offerings that have preconfigured processes and workflows and might also be able to handle needs unique to an industry. They have extended that strategy to the cloud, and cloud-native vendors have followed suit. “Setting up ERP is a long, complicated journey,” says Prakash Darji, senior vice president and general manager for PaaS at SAP. “Industry-specific applications make it easier for new customers to get started on the ERP journey.”

**Business enablement**

The deciding factor for companies evaluating cloud-based ERP systems boils down to the value added and practical considerations like cost, ease of implementation, level of support and issues related to legacy systems. “Sometimes it’s about business enablement,” says Beck. That enablement might be providing mobile access to remote staff or deeper, faster analysis and reporting.

“Savings in hardware and operating expenses are not enough,” says Darji. “[Customers] need to shift to something significantly better, not the ERP of yesteryear.”

Pope says that Infor does an assessment with cloud customers that weighs benefits against ongoing overhead such as hardware, database maintenance, labor and applications, as well as the costs associated with upgrades. “The savings are usually about 20 percent, but it varies by industry and customer. Even if the costs are close, senior management can make the decision [to go to the cloud based on other benefits],” she says.

“Companies need to do an ROI
analysis to know the costs and risks to migrate,” says Linthicum, adding that they will need to decide which elements to replace, refactor or retire. The risks and costs will be higher for companies that have built their business around processes specific to an on-premises ERP system, especially if they’ve done a lot of customization in that system’s proprietary language. “The cloud has always been hyped as cheaper, but that’s not always the case,” he says.

Many companies are taking a cloud-first approach to ERP and the ancillary software that connects to it. This means that their preference is to use a cloud-based option if it makes sense. This strategy will eventually wean the company off of its on-premises systems without the disruption and risk of moving everything to the cloud at once.

In the meantime, these companies support hybrid cloud/on-premises setups, and that can present challenges. Oracle customer GE, for example, has more than 300 ERP instances globally. “Because of the size and customization, GE can’t rip and replace them,” said Ng. GE’s strategy is to use the cloud for its fast-growing businesses that might be hampered by its legacy systems.

Greater ease of use and accessibility

Integrating applications and data that live outside a core ERP system has always been a nightmare. Interface connections need to work with every version of the ERP system across the enterprise. APIs often don’t exist, and building connections to tie everything together might require using a programming language that’s proprietary to the vendor of the on-premises system.

Cloud-based ERP relies on configuration, since the vendor must maintain consistent system code for all customers. That consistency enables benefits beyond the elimination of upgrades. APIs can be standardized, and systems work more reliably and are easier to keep up to date. ERP vendors can build richer API libraries, which broadens the scope of data available for analysis and reporting in the ERP system.

A single code base also brings consistency and flexibility to the user experience. Cloud-based applications raise expectations for ease of use and accessibility. The cloud allows for greater “abstraction from complexity,” says SAP’s Darji. “We are providing a consumer-grade experience [through S/4 HANA]. You can’t expose [users] to the back-end complexity.” What this means is that, rather than using a generic interface that requires users to sort through many options, SAP can simplify user interfaces for specific tasks and specific roles.

“No matter what kind of features the ERP system has, businesses will never derive ROI from it if their employees won’t use it,” says Umran Hasan, a senior marketing manager at Microsoft. Speed to insight from data, ease of use, mobile access and flexibility for employees to get what they want when they need it will increase usage, and all are...
enabled by the cloud.

It’s even easier to bring the interface down to the individual level — for example, allowing sales reps to see personalized views of their deals in progress and performance. While this is possible to do with on-premises ERP, it requires a great deal of customization.

The capability to create specialized and simplified user interfaces provides the flexibility needed to make ERP applications accessible on different devices, such as smartphones and tablets.

**Smarter, more connected**

With on-premises ERP, separate tools pull in data to analyze and report on it, perhaps hours or days after the transactions that created that data occurred. This separation of data, transaction and analytics has been responsible for shortcomings in even the most essential reporting areas.

“It’s very common to talk with customers who have never had a single global rollup accounting report that they can depend on,” says Workday’s Beck.

Cloud-based ERP makes it easier to embed the analytics and reporting in the transaction system so users can see reports in real time. Most cloud ERP vendors use an in-memory storage and analytics architecture, which provides the speed to do real-time analysis that traditional server-based storage just can’t match.

The consistency of cloud ERP updates and integration points makes it easier to pull all of the relevant data into the system and report on it at the transactional level, even if that data is outside of core ERP applications.

The level of connectedness and the embedded analytics that cloud ERP offers are opening up new possibilities in two areas. First, it’s now possible to pull in data from outside sources, specifically social media and the connected devices that make up the IoT. Second, those capabilities make it possible to automate decision-making or predict behavior — actions that rely on machine learning, where the system anticipates outcomes based on patterns.

The capability to automate decision-making by predicting behavior can be useful in accounts receivable operations. For example, Workday’s Beck suggests...
that the system might analyze customer payment patterns to see who is more or less likely to pay their bills, and then make recommendations about which customers to target in bill collection efforts. For large companies, a small improvement in payments could add millions of dollars to the bottom line.

Improved integration of enterprise systems with social media can offer payoffs of its own. For example, Workday's system can pull information about people with certain skills off of LinkedIn — a capability that could prove valuable for recruiting.

The IoT opens up a lot of interesting possibilities for giving companies deeper, more refined views of their businesses. SAP's Darji cites asset valuations as an example. “You typically put assets on a balance sheet and depreciate them over time,” he says. “But if you put sensors on those assets, you can valuate them based on utilization instead of time, allowing you to write off underutilized assets.”

**Go cloud or go home**

More companies are likely to take cloud-first or even cloud-only approaches to ERP as the cloud becomes the dominant means of deploying enterprise software. In fact, businesses may find themselves without a choice in the near future. ERP vendors are pursuing their own versions of cloud-first strategies and are pouring resources into developing their cloud-based ERP offerings. Gartner predicts that 30 percent of the 100 largest software vendors will shift to cloud-only models by 2019. Companies that don't embrace the cloud may find themselves with limited options — and at a competitive disadvantage.

Michael Nadeau is an analyst and writer in New Hampshire.

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**Most security breaches happen due to human error**

- 4 out of every 5 data breaches caused by human error are unintentional
- 4 out of every 5 security events caused by insiders have a negative impact on their enterprise organization (including loss of confidential information, critical system disruptions, reputational harm, lost customers and more)

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As a result, GE has begun looking to Web 2.0 companies like Google and Amazon for inspiration. “The digital transformation at GE has helped anticipate the needs of a technology-driven society, and it has been both rapid and dramatic,” Colin Parris, vice president for software research at GE Global Research, wrote in June of this year. “A few years ago, people compared us to other industrial conglomerates like Siemens and United Technologies. Now, as we declare GE will be a top 10 software company by 2020, we’re being compared to the internet and software giants that also have changed the way we live: Amazon, Microsoft, IBM and Google.”

The industrial internet is different
But Parris also notes that the industrial internet has different needs. Analytics in the consumer internet, he says, are all about analyzing massive volumes of data to connect people and things. The data generated in the industrial space is orders of magnitude more massive, but the events that matter are actually few and far between. “In the industrial space, the events that are important to me are failures,” he says. “The valuable
data that tells me about an event that I want to focus on so I’ll never have it again in the industrial space is tiny.”

For instance, in the course of 1 million flights using GE’s jet engines, there might be 29 events that prompt an airline to bring a plane in for maintenance.

Finding those 29 events in a sea of data is no easy task. “If you don’t know where to look, you’ll get lost trying to find it and never achieve the outcome you or your customer is seeking,” Parris says.

GE’s answer is the “digital twin.” A digital twin is a digital model of a physical asset. The key, Parris notes, is that the company doesn’t just use one digital model that represents a fleet of assets. Instead, there are one-to-one representations of every asset. Each jet engine on a plane and each wind turbine in a wind farm gets its own digital twin. Sensors on the actual assets feed their twins. Since much of GE’s products operate in conditions that are inimical to sensors — the temperature inside a jet engine’s combustion chamber can reach 2,000 degrees Celsius — the company supplements physical sensors with virtual sensors.

Digital insights
On an aircraft, virtual sensors use data collected by physical sensors and modify it according to the physics of combustion, the physics of aerodynamics and the physics of the materials involved. Machine learning is used to tune the accuracy of the output of virtual sensors.

In this way, the digital twin can provide precise insights into the state of a particular asset. These insights can help airlines better plan maintenance. For instance, an aircraft engine blade operating in the sandy conditions of the Middle East can suffer what’s known as “spallation,” in which materials begin to erode. Replacing such a blade can cost $20,000, Parris notes. And the price rises if the plane is grounded for a time because a part is not immediately available.

With a digital twin, the airline can track the damage state for each blade in each jet engine.

“Every time a plane lands, we get data,” Parris says. “If the level of damage is at 2, and I need to change it when it gets to 8, I could change it at six months. Or we could decide to do a water wash on that blade. When the plane has landed on the ground at night, I could wash those blades with a solution, causing some of the dust to fall out. That water washing is expensive, but it could allow you to come in 10 months later rather than six months.”

Bringing all this together requires deep domain expertise. “In the industrial space, I’m having less and less problems, and yet I’m trying to predict the problems so I don’t have them,” Parris says. “I have so little data, I’ve got to use the domain knowledge that I have: physics knowledge, historical knowledge, insight from engineers and service workers. The only way to supplement sparse data is domain expertise.”

Thor Olavsrud is a senior writer for CIO.com.
CIOs aren’t using the ‘Force’ to drive innovation

The lack of initiative leads corporate execs to have low expectations of the role IT will play in business transformation. By Rick Pastore

In my previous column, I defined the potent cross-enterprise perspective that’s unique to IT leaders and is most typically employed to empower fiduciary responsibilities that protect the business. Integrated asset management, data-related compliance, risk and vulnerability profile management — those are all critical duties that would go unfulfilled if not for IT leadership.

But in our era of digital business transformation, these conservation-oriented responsibilities are only half the value CIOs are capable of — and ought to be — delivering enterprisewide. The other half encompasses a set of responsibilities that map to enterprise innovation and directly drive the transformation so many businesses are undergoing. The problem is, few CIOs have managed to unlock this side of the “Force” and take ownership of these innovation-driving responsibilities.

First, let’s review the top 10 enterprise-spanning visibility areas that members of the CIO Executive Council have delineated.

1. How work gets done across the enterprise.
2. The conversion path of data into information into knowledge.
3. Processes that channel and tap
In our era of digital business transformation, conservation-oriented responsibilities are only half the value CIOs are capable of – and ought to be – delivering.

While many of these areas map naturally to fiduciary responsibilities, the first four are directly applicable to today’s highest transformation priorities. They’re a potent combination and make a strong argument for the CIO’s place on the business transformation agenda. That is, if CIOs tap into them. And so far, they aren’t.

CIO Executive Council members outlined a dozen cross-enterprise, innovation-driving responsibilities that IT could and should own — all powered by IT’s silo-bridging perspective. Yet, my casual research among Council members shows that few have managed to assume these duties. Here’s a rundown that shows the percentage of IT leaders claiming responsibility for each of the 12 activities:

55% Educating business leaders on the emerging digital landscape.
41% Promoting ongoing collaboration among business units.
32% Identifying value opportunities in the end-to-end customer experience.
27% Identifying and/or assessing new data analytics capabilities.
23% Identifying and/or assessing emerging tech sources for new customer value or engagement.
18% Managing data and analytics across the entire customer experience.
18% Driving a vision for the digital future of the business.
18% Leading the overall enterprise business transformation effort.
14% Identifying opportunities to apply isolated innovations to other areas of the business.
14% Aligning research and development efforts with each other and with corporate strategy.
9% Managing the enterprise innovation process (the idea life cycle).
9% Introducing contemporary management methodologies (e.g., agile) to business initiatives.

Boards of directors, CEOs and the CIO’s peer executives are wondering what IT’s role should be in business transformation. Many have low expectations of that role. Looking at the minuscule percentages above, I can’t blame them.

Pastore, the former vice president of strategy for the CIO Executive Council, is now a senior analyst with The Hackett Group.
For many years, the CIO was the chief guard of the castle, tasked with creating a layer of protection while providing end users with the tools and products they needed to get their work done. It was a quiet job — one that took nerves of steel and the ability to fend off attacks from budget-cutting CFOs, business and marketing groups dazzled by the latest “revolutionary” software, and CEOs grappling with creating new revenue streams. Through it all, the stalwart CIO was there, always ready, always in control.

Until mobile arrived.

Suddenly the CIO was taking hits from all sides as rogue devices began to infiltrate the ecosystem and mobile apps proliferated, often with little or no security or oversight attached.

With mobile, IT faces opposition from within by marketing and business units that have new weapons at their disposal. Third-party developers are ready to deliver custom, user-friendly applications in record time, and a recent IDC study finds that 72 percent of organizations plan to work with outside vendors to develop mobile applications.

Faced with these new challenges, two types of CIOs emerged: the survivor and the innovator.

The survivor
Survivor CIOs doubled down on fortifying the castle, prohibiting the use of new devices, controlling all aspects of hardware and software, and closing security holes with an iron fist.

That approach fit with the way technology had been handled.

With mobile, it’s time for IT to lower the drawbridge

CIOs need to forgo the fortress mentality and shift their focus to embracing outside development of mobile apps.

BY MIKE JENNETT
in the past, with IT having complete control over closed systems. However, with the proliferation of devices and software, simply fortifying against mobile systems left these IT leaders with an organization that could no longer provide the tools their users needed to do their jobs.

Survivors’ IT departments began to lose development dollars as users in business units found ways to go around IT to get what they needed.

The innovator

The second type of CIO, the innovator, took a very different approach, and it’s an approach that I often recommend to my clients.

The innovator’s approach entails creating a strategic plan that tears down the walls of IT and opens systems to both business users and third parties through a combination of strategy, policies and software.

Thriving in mobile

To thrive in this new world of an open IT architecture requires development of the following:

- A strong mobile strategy that incorporates mobility policies and integrates mobile software.
- Base mobile technologies that integrate with existing systems and support the secure development and deployment of mobile apps.
- A center of excellence, led by IT, that crosses over to include business as well as corporate representatives and oversees the development and deployment of mobile apps.

Implementing these aspects of design and development into the overall IT plan will allow you to meet the unique challenges of the mobile world with open arms rather than closed fists. Further, by embracing mobile, your team will have the ability to monitor and control what’s going on with business and marketing development rather than fighting against them.

This gives your IT team an opportunity to shine as innovators who are enabling the business. And the business, in turn, will want to come back to see what else IT can offer in the way of technology services.

No longer will IT be relegated to the thankless job of keeping the lights on. Instead, tech professionals will be seen as the company’s innovators and the proud protectors of the enterprise’s data and infrastructure.

Mike Jennett is vice president of mobility strategies for IDC’s IT Executive Programs.
What it takes to be a research scientist

How do you prepare for, land and succeed in the hottest roles in IT? Here’s look at the broad range of skills a research scientist needs. BY SHARON FLORENTINE

If you want a job as a research scientist at an iconic tech company, you’ll need a broad range of skills. Just ask Amanda Stent. The path that led to her current role as a research scientist at Yahoo started with a high school class on artificial intelligence, followed by a college degree in math and music, and then a Ph.D. in computer science.

She’s now a computational linguist, and the projects she works on at Yahoo are aimed at helping computers understand and produce language. She says studying music was just as valuable as studying math and computer science. “The music major gave me experience performing in public and a lot of experience in practicing until you get something right — that’s really critical for research,” Stent says.

A résumé like Stent’s — one that reflects a broad and deep set of skills and experiences — is critical for a research scientist, says P.K. Agarwal, regional dean and CEO at Northeastern University–Silicon Valley.

“Large companies are usually looking at master’s and doctorates for these positions, and...
they want to see diversity in the educational background and experience,” he says. “They are trying to bring together people across disciplines to balance the conversations around technologies and new research and development, so you need more than hard skills. By the time you are past the R of research and into the D of development, the world and the tech may have changed, so there’s strategic value in education outside the traditional CS, mathematics and analytics.”

**Constant change**
Stent agrees that being able to keep up with changes in technology is key to success in applied research. Research scientists must constantly learn new programming languages, she says. But again, breadth is key. In addition to requiring knowledge of multiple programming languages, Stent says her role requires mastery of linear algebra and statistics. And there’s another skill that’s invaluable: communication, specifically writing, because much of research involves persuasion. “We’re constantly being asked to convince people that what we’re working on is both novel and relevant,” she says.

For a computational linguist like Stent, communication isn’t just a soft skill. Her work involves research into ways to facilitate human-machine interactions through technology like chatbots and dialog systems. One of her areas of focus is analytics of human conversation.

**Steady demand**
Job titles in tech research include data scientist, data analyst, research engineer and research assistant, and Dice.com’s data and research team reports that demand for people to fill those jobs has been steady “with a few peaks in May 2015 and January 2016.” Startups can be fertile ground for IT professionals interested in research. “The starting point for many innovative IT companies is, ‘I have this idea and can build this technology, but how do I make money with this thing?’” Agarwal says.

**No success like failure**
For Stent, the best part of her job is working with brilliant, innovative and creative people. However, she has a couple of caveats for anyone thinking of a software or engineering research role: First, understand that it takes a lifelong commitment to learning and continual innovation, and second, understand that failure is part of the job. “We are inventing the future, so there’s always going to be failure, sometimes over and over again, until something succeeds,” she says. But then, she adds, there are “the moments when you have a breakthrough — and that’s the splendor of it all.”

“We are inventing the future, so there’s always going to be failure, sometimes over and over again, until something succeeds. . . . And that’s the splendor of it all.”

– AMANDA STENT, RESEARCH SCIENTIST, YAHOO

Sharon Florentine is a senior writer at CIO.com.
The Real SaaS Manifesto
In today’s IT landscape, many organizations have adopted a cloud-first approach to business systems. But with so many vendors offering SaaS solutions, how do organizations know which vendor will enable them to achieve the true benefits SaaS has to offer? What are the characteristics to look for when considering a SaaS solution, and what are the real impacts on modern businesses? From IT professionals to anyone just looking to get a basic understanding of SaaS, this paper will explain it all.

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CIO.com surveyed 571 global IT leaders and collected their findings in the 15th annual “2016 State of the CIO” report. One of the priorities that emerged is using technology as a revenue driver. CEOs are looking to their technology leaders to play an active role in developing business strategies by introducing new digital revenue streams and improving organizational agility. Download the 15th annual “2016 State of the CIO” report to learn what priorities and challenges are facing IT executives today.

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