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THE ENTERPRISE GETS SMART

Companies are starting to **leverage** artificial intelligence and machine learning technologies to **bolster** customer experience, **improve** security and **optimize** operations.

BY BETH STACKPOLE

contents MARCH/APRIL 2017

cover story

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BY BETH STACKPOLE

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COVER ART BY TAYLOR CALLERY

AI takes a seat at the table

I used to think of HAL in '2001: A Space Odyssey' when I heard the term 'artificial intelligence.' Now I think of poker.

Dave: *Open the pod bay doors, HAL.*
HAL: *I'm sorry, Dave. I'm afraid I can't do that.*
Dave: *What's the problem?*
HAL: *I think you know what the problem is just as well as I do.*

That classic exchange between HAL 9000 and Dave Bowman in the movie *2001: A Space Odyssey* is what I used to think of when I heard the term *artificial intelligence*.

In this issue's Emerging Tech section, Thor Olavsrud reports on a real-world example of artificial intelligence getting the better of humans — one that has far-reaching implications here on earth. Now when I think about AI, I think about poker.

Carnegie Mellon University's Libratus AI beating four world-class Texas hold 'em players at their own game may not give you the same chills as HAL refusing to open the pod bay doors, but the win was big news for science, IT and business. It's more significant than IBM Watson's besting of *Jeopardy* champions because Libratus beat people who are masters at bluffing, mind games, and knowing when to hold 'em and when to fold 'em.

"The best AI's ability to do strategic reasoning with imperfect information has now surpassed that of the best humans," CMU computer science professor Tuomas Sandholm told Olavsrud.

Humans are good — some more so than others — at harnessing incomplete information or using misinformation to their advantage. To conquer Texas hold 'em, AI needs to play that game. "The computer can't win at poker if it can't bluff," said Frank Pfenning, head of the Carnegie Mellon School of Computer Science. "Developing an AI that can do that is a tremendous step forward. . . . Imagine that your smartphone will someday be able to negotiate the best price on a new car for you."

As Beth Stackpole reports in this issue's cover story, AI in the business world is off to a more modest start. After all, Libratus has the Pittsburgh Supercomputing Center's Bridges system behind it. That said, well-known brands such as TGI Fridays and Capital One are using AI to better serve customers.

Explaining how TGI Fridays came to use smart chatbot technology, Sherif Mityas, the chain's vice president of strategy brand initiatives and acting CIO told Stackpole, "We thought about how technology could help us create that one-on-one personalized messaging outside of the bar without having to hire 1,000 people to respond to individual guests."

How should smart CIOs approach AI? Proceed with caution. Remember, HAL ended up failing, and CMU's first poker-playing AI didn't win. Babson College professor Tom Davenport offers this advice: "Unless you're trying to totally transform the business model, it makes sense to be more conservative and have a portfolio of projects that is less dramatic than trying to pull off a moon shot."

– *Dan Muse, editor in chief,* CIO.com

The old business-IT debate still rages

"Let's stop rehashing the IT-business debate. Let's focus on how IT advances the business."

When I started my high-tech media career 16 years ago, business-IT alignment was a hot topic, and it still is today. Google the phrase "business-IT relationship" and you'll find scores of articles on the topic; it even has its own Wikipedia entry.

Is there any C-level executive who gets poked, prodded or questioned more than the CIO? I don't hear much discussion or debate about the business-finance relationship or the business-marketing relationship. When was the last time you read an article that put a date on the demise of the CFO, CMO or COO?

We often say in these pages and on CIO.com that IT is now the business. How can we still be talking about IT and the business as though they're separate? In this day of digital business and technology advancement, we need to stop separating the two and speak about IT as being as much a part of the business as any other department. I'm not naïve enough to think that all CIOs are equal or that there aren't any organizations where the IT-business relationship is broken beyond repair, but broken business relationships aren't unique to CIOs.

In our 2017 State of the CIO survey, we asked 200 non-IT business executives to characterize their relationships with their CIOs when it comes to technology considerations. We gave them five choices, ranging from the positive strategic adviser or consultant, to the neutral risk assessor, to the negative roadblock or rogue player. The responses were largely positive; 63 percent said they view CIOs either as strategic advisers or consultants. The key factor in how CIOs are perceived is how proactive they are. To earn strategic adviser status, CIOs need to offer ideas, opportunities and solutions.

What about the nearly 20 percent of business leaders who view CIOs as roadblocks or rogue players? These are the situations where business people feel they have no support from the CIO and must go around IT to get things done. Most CIOs I speak with say they have themselves to blame if there is a broken relationship with other business units and shadow IT is rampant in their organization. They say they haven't done enough to demonstrate the benefits of working with IT, and they haven't explained the potentially harmful side effects of working around IT.

I've said before that I don't think there's ever been a more interesting time to be an enterprise CIO. Is it tough? Sure. And those who are stuck in their old ways probably should move on. But there are so many great stories of CIOs and their teams making meaningful contributions to their businesses. Let's stop rehashing the old IT-business debate, recognizing that managing IT's relationship with the business is table stakes for today's CIOs. Instead, let's focus on how IT advances the business. Those are the stories that will move us forward.

– Adam Dennison, SVP and publisher, CIO.com
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An AI that knows when to hold 'em

An artificial intelligence has beaten four of the best Texas hold 'em poker players in the world, and its mastery of imperfect information could yield a multitude of real-world applications.

BY THOR OLAVSRUD

Marking a major step forward for artificial intelligence (AI), Libratus, an AI developed by Carnegie Mellon University (CMU), has beaten four of the world's best heads-up no-limit Texas hold 'em poker players in a marathon competition.

After 20 days and 120,000 hands played from Jan. 11 to 30, Libratus closed out the "Brains vs. Artificial Intelligence: Upping the Ante" tournament, leading the pros by

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$1,766,250 in chips.

"I'm just impressed with the quality of poker Libratus plays," pro player Jason Les said at a press conference, after losing $880,087 worth of chips. "They made algorithms that play this game better than us. We make a living trying to find vulnerabilities in strategies. That's what we do every day when we play heads-up no-limit. We tried everything we could, and it was just too strong."

AI gets a rematch

The results were different 18 months earlier at the first Brains vs. Artificial Intelligence tournament, in which a Carnegie Mellon AI called Claudico took on Les and fellow pros Dong Kim, Bjorn Li and Doug Polk at the Rivers Casino in Pittsburgh. In that contest, Claudico and the human pros collectively played 80,000 hands, and when the dust cleared, Polk, Kim and Li had more chips than Claudico, while Les trailed.

Artificial intelligences have challenged humans in all manner of games over the past few decades, but heads-up no-limit Texas hold 'em has widely been considered the far frontier.

That time, "the humans won; as a group, they won," Tuomas Sandholm, professor of computer science at CMU told CIO.com. But, he added, the result wasn't statistically significant. "Even playing against those absolute top players, it was a statistical tie," he said.

In the next contest, pitting the poker pros against Libratus, Sandholm and Ph.D. student Noam Brown hoped to get a statistically significant result by increasing the number of hands played. Brown said a statistically significant result would require winning by 77,000 big blinds per hand. Libratus went far beyond, winning by 147,000 big blinds per hand.

"The best AI's ability to do strategic reasoning with imperfect information has now surpassed that of the best humans," Sandholm said.

Why the victory matters

Artificial intelligences have challenged humans in all manner of games over the past few decades, but heads-up no-limit Texas hold 'em has widely been considered the far frontier. It is a game of imperfect information — the players know only some of the cards in play, and they can bluff and mislead their opponents — and its complexity is immense. The game features 10^{160} (the number 1 followed by 160 zeroes) information sets, significantly more information sets than the number of atoms in the universe.

Libratus' victory has implications wherever information is incomplete and opponents sow misinformation, Frank Pfenning, department head of the Carnegie Mellon School of Computer Science, said in a statement. Those areas range from business negotiation to military strategy, cybersecurity and medical treatment.

"The computer can't win at poker if it can't bluff," Pfenning said. "Developing an AI that can do that successfully is a tremendous step forward scientifically and has numerous applications. Imagine that your smartphone will someday be able to negotiate

the best price on a new car for you. That's just the beginning."

Powerful ally

Libratus, though, had significantly more computing power behind it than your phone. It devised its strategy with the help of the Bridges supercomputer, a National Science Foundation-funded system at the Pittsburgh Supercomputing Center (PSC).

Throughout the tournament, Libratus used about 19 million core hours of computing and a knowledge base of 2,600 TB of information, said Nick Nystrom, principal investigator for the Bridges project and senior director of research at PSC. In all, Libratus used about 46 percent of the supercomputer's computational capacity.

"After play ended each day, a meta-algorithm analyzed what holes the pros had identified and exploited in Libratus' strategy," Sandholm explained. "It then prioritized the holes and

> "The best AI's ability to do strategic reasoning with imperfect information has now surpassed that of the best humans."
>
> – **TUOMAS SANDHOLM**
> PROFESSOR OF COMPUTER SCIENCE, CMU

algorithmically patched the top three using the supercomputer each night. This is very different from the way learning has been used in the past in poker. Typically, researchers develop algorithms that try to exploit the opponent's weaknesses. In contrast, here the daily improvement is about algorithmically fixing holes in our own strategy." ♦

Thor Olavsrud is a senior writer at CIO.com.

Engineering digital innovation

Purdue University's CIO strives to blur the lines between IT and the larger enterprise.

BY BRENDAN McGOWAN

"An investment in knowledge always pays the best interest" is a saying often attributed to Benjamin Franklin. Education and knowledge acquisition — in all forms — will always be the primary currency of digital transformation and innovation. The economic stakes could not be higher, and the challenges are real: According to initial data from the 2017 IT Talent Assessment Survey, produced by the CIO Executive Council (CEC), 72 percent of global IT leaders report that there are not enough qualified IT job candidates in the talent pool.

Gerry McCartney, CIO of Purdue University in Indiana, is one of the IT leaders setting the stage for an ongoing transformation in the way students learn, how research is conducted and how technology is perceived. He must juggle the increasing demands of a highly mobile and dynamic millennial population with the long-term technical strategy of a high-profile university. "We [in IT] find ourselves standing side by side with the more adventurous faculty as they find new ways to do things, and to [continue] the transformation," he says.

Purdue has some of the world's highest-ranked engineering programs, and for eight of the past 10

years the university has awarded more engineering and engineering-related bachelor's degrees than anyone else. The campus location in Tippecanoe County, Indiana, however, has made connecting Purdue graduates with immediate employment opportunities more challenging.

Bringing tech jobs to engineering students

"It's a little bit of a liability being located where we are because we aren't in Chicago or Philadelphia or Los Angeles or New York," McCartney says. "And you can't just walk out the door and walk in to a little part-time job."

To bridge that gap, Purdue launched an internship program called Pathmaker. More than a dozen organizations — from start-ups to large companies — have set up facilities in Indiana, each with a professional supervisor dedicated to helping Purdue students acquire entry-level technical jobs.

> "We [in IT] find ourselves **standing side by side with the more adventurous faculty** as they find new ways to do things."
>
> – **GERRY McCARTNEY,** CIO, PURDUE UNIVERSITY

The students get practical experience, often in technical realms, providing them with new perspectives about themselves and the world around them.

"It's creating opportunities for people who wouldn't otherwise have those opportunities — and using a strength we already have here because we have very high quality students, and we have a lot of them," McCartney says. "So it seems like a pity that companies can't take advantage of that and students can't take advantage of being a member of this group. And Pathmaker enables that to happen."

Technology: Dawn or doom?

McCartney says that academics, students and the public at large need to have a sustained, open conversation about the implications of massive change — a topic McCartney started thinking about a few years ago after reading a book given to him by Purdue's president, Mitch Daniels. The book, *Our Final Invention: Artificial Intelligence and the End of the Human Era*, by documentary filmmaker and author James Barrat, is about the future of artificial intelligence (AI), and it prompted some introspection — and an idea for a new conference. In October 2016, Purdue hosted a multi-day meeting to discuss the implications of technologies such as AI, robotics, internet surveillance and data science. Called "Dawn or Doom 2016: Is Technology Moving Faster Than Our Ability to Understand?" the event was part of a series McCartney started in 2014.

The public conference, McCartney notes, was a reflection of the academic values — inquiry, dialogue and scholarship — that the university represents. Further, it reflected the changing role of the academic CIO at a time of rapid transformation. By initiating the discussion, McCartney says he hoped to show that CIOs aren't "just running computers and providing IT services, but also giving the institution something that it self-consciously values."

Tracking behavior to improve academic success

One of Purdue's values is, of course, student success. And its use of long-extant but underutilized data in new and innovative

ways, is another manifestation of its ongoing digital transformation. The university's latest data project, called Forecast, uses thousands of data points of student behavior at an individual level to identify those behaviors most highly related to academic success.

Stressing that correlation does not equal causation, McCartney describes a set of factors that have correlated positively with student success. For example, the university can track students' movements via the ID cards they use to enter dining halls, athletic facilities and dormitories. And it can correlate certain behaviors — such as routinely being on campus when not in class, or registering for courses in a timely fashion instead of procrastinating — with positive social and academic outcomes.

"What we see," McCartney says, "is that people who are engaged in the community; who are here because they want to be here; who make friends; who engage in the community, with a small *c*; [and who participate in] activities, like going to the [gym], or going to a game or even going out to party — as long as you do that at a moderate level — that's the ideal outcome. You're going to do as well as you can do."

This use of data is in keeping with Purdue's technological mission to drive research and human understanding. Every year, the school builds a high-performance computer for the faculty's use, and McCartney says those projects are funded in part by "a novel business model that makes the faculty researchers and the university joint investors, so we call it a community cluster program." More important, the ongoing effort to develop a competitive supercomputing program is part of Purdue's continued focus on "speed to science" that McCartney oversees.

> "The CIO's role is at this important **inflexion point** where either we become extraordinarily **relevant** or we become **irrelevant**."
>
> – **GERRY McCARTNEY,** CIO, PURDUE UNIVERSITY

CIOs: transformational or irrelevant?

The byproduct of all this change, McCartney says, is something approaching ambivalence about the role of the CIO.

"I do think we're at some kind of transition point, because of the maturity of the technology and because now many people think they understand it — [and] maybe they do understand it well enough to make business decisions," he says. "But I think the CIO's role is at this important inflexion point where either we become extraordinarily relevant or we become irrelevant."

The answer to potential disruption, as McCartney sees it, is transformation. In his case, he says the evolution of IT's responsibilities is evident in the Dawn or Doom conference, the Pathmaker internship program and other initiatives. Such projects, he says, are indicative not only of a forward-thinking CIO, but of someone taking the steps to blur the lines between IT and the larger enterprise. The implications are positive not only for Purdue, but for academic computing in general. ♦

Brendan McGowan is global media bureau and client research manager at the CIO Executive Council.

THE ENTERPRISE GETS SMART

Companies are starting to ***leverage*** artificial intelligence and machine learning technologies to ***bolster*** customer experience, ***improve*** security and optimize operations.

BY BETH STACKPOLE

TGI FRIDAYS may have a reputation as a casual restaurant and watering hole, but its messaging to customers was hardly conversational. The well-known chain sent out regular blasts through traditional broad-reach media and, more recently, social media, yet it increasingly wanted to re-create the banter that happens organically when regulars belly up to the bar. »

ILLUSTRATIONS BY TAYLOR CALLERY

In lieu of hiring a battalion of customer service "bar keeps," TGI Fridays recruited an enterprise conversation platform infused with a shot of machine learning and artificial intelligence (AI) to personalize its messaging and overall customer experience. Now, patrons can chat up the AI for happy hour suggestions and appetizer specials, engage in small talk using emojis, make reservations, and order takeout via social media channels and through Amazon Alexa.

"We thought about how technology could help us create that one-on-one personalized messaging outside of the bar without having to hire 1,000 people to respond to individual guests," says Sherif Mityas, vice president of strategy and brand initiatives, as well as acting CIO, at TGI Fridays. "We wanted to be part of the conversation when someone was thinking about where to go for happy hour or get recommendations on the most popular drink. That's where the initial power of chatbot technology comes into play."

*"We thought about how **technology** could help us create that one-on-one **personalized** messaging . . . without having to hire **1,000 people** to respond to individual guests.* – **SHERIF MITYAS**, VP AND CIO, TGI FRIDAYS

The restaurant chain's chatbot, created with Conversable, is just the appetizer in what is expected to be a full course meal as AI and machine learning capabilities take root in other enterprise systems, from security platforms to sales systems. While hardly newcomers to the technology scene, AI and machine learning have burst into the mainstream in recent months. Stories about robots, autonomous vehicles and smarter consumer products are grabbing headlines, and voice-powered digital assistants like Alexa and the recommendation engines of companies like Netflix and Amazon have become familiar parts of our everyday lives.

At the same time, technologies such as Google Deep Mind and IBM Watson, once ivory tower research projects, are also gaining notice as the engines that power a variety of applications in sectors like healthcare and finance (H&R Block's tax preparation service is one example).

Early days still

espite the hype, it's still early days for AI, especially in the enterprise. The technologies are still evolving, although much more rapidly today, thanks to nearly unlimited computational power, the collection of vast amounts of data and advances in neural network capabilities. While the terms AI, machine learning and deep learning are used somewhat interchangeably, there are differences among them, and failure to grasp those differences can lead to confusion.

AI constitutes the broader concept of employing machines or systems to carry out tasks intelligently. Machine learning is an application of AI whereby a system learns how to act on its own based on the data being collected. Deep learning, a subset of machine learning, applies many layers of neural network models and algorithms to solve highly complex and data-intensive problems.

In a recent Forrester Research

survey, just 17 percent of the respondents said that they will be implementing or expanding their use of AI systems over the next year. However, 55 percent said they intend to invest in the technology over the same time frame. Nearly half of those polled said they hadn't yet seen any results from their AI initiatives, and the lion's share have invested or plan to invest less than $1 million in such efforts through 2018.

Mastering AI takes time

One factor holding up the spread of AI in the enterprise is the learning curve, because most IT leaders and executives still don't fully comprehend the nuances of the AI stack, much less understand how to apply the technologies to solve real business problems, experts say. On top of that, organizations are grappling with the usual budgetary, business case and talent gap concerns that remain barriers to implementing many cutting-edge IT projects.

"Last year, everyone got so focused on chatbots, machine learning and AI that they started to use [the terms] all magically and interchangeably, but it created massive market confusion," says Ben Lamm, CEO of Conversable. "Every major company now gets the point that AI can have massive implications to the business — they just don't know how to get there."

The first wave of interest seems to be around leveraging AI technologies to improve customer experience and support. Fifty-seven percent of respondents to the Forrester survey cited improving the customer experience as a reason for using AI, with 37 percent reporting that they're implementing or planning to implement intelligent assistants, and 35 percent saying they're working to develop cognitive products for customers.

One area where machine learn-

AI poised for mass adoption

Experimentation with artificial intelligence and machine learning continues as enterprises strive for improved customer service and operational efficiency. BY CLINT BOLTON

Experimentation with voice-activated assistants and text-triggered chatbots blossomed in 2016, spawning systems that made it possible for people to check the status of UPS packages, order office supplies from Staples and use Slack's messaging interface to order from Taco Bell.

In 2017, some of those tools will no longer make the cut while others will proliferate across consumer and enterprise sectors, creating new workflows, operational efficiencies and opportunities for improved customer service.

The early sign is that Amazon's Alexa, though positioned as a home product, could become the go-to platform for voice-based assistants for businesses.

Wynn Hotels plans to equip nearly 5,000 rooms with Amazon Echo devices, which guests will be able to use to query Alexa for room and hotel information. And FedEx is using Amazon APIs to build an app that lets you ship packages by saying, "Alexa, I want to ship a package," according to FedEx CIO Rob Carter.

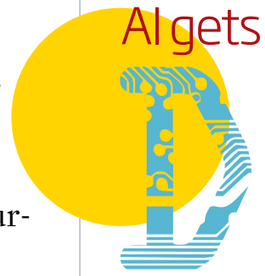
"When you think about the complexity of global shipping, it's quite an intense world," says Carter. "Our belief is that we can create ML [machine learning] and AI [artificial intelligence] capabilities to ship complex things around the world and get the documentation just via a conversational approach." Ideally, a FedEx worker could tell Alexa how much a

TAYLOR CALLERY

ing and smart algorithms are starting to have a significant impact is in detecting known and unknown attacks, thereby allowing IT security professionals to take a more proactive security posture. Sales and customer service are other areas where AI technologies are starting to deliver results: In a survey conducted by the Accenture Institute for High Performance, 40 percent of companies said they're using machine learning to improve sales and marketing performance.

"The interest in the enterprise in doing something with AI is really high," says Joshua Feast, CEO and co-founder of Cogito, which markets a platform that leverages real-time intelligence and machine learning to help call center workers better engage with customers. "The problem CIOs are finding is that a lot of the things they want to do are on the margin, like implementing a different type of UI on a website. The only way to move core metrics is to impact major operations . . . and CRM, sales, security and call centers are the best way to do that."

AI gets to work



Ian Olley, CTO of Elsevier, is exploring enterprise AI use cases on a number of fronts. The information services provider is test-driving AI-based security software to up its cybersecurity game. It also has interest in leveraging AI capabilities in its CRM platform to improve lead generation, and is actively evaluating tools such as chatbots and knowledge management systems to improve its customer support experience. For example, Elsevier's technology and developer group is already benefiting from an AI-based knowledge management system that dynamically identifies relevant content and delivers it to the appropriate person without human involvement, Olley says.

Elsevier is also using AI to package weighs and where they want it shipped rather than looking through long lists of commodity tables and commercial invoices.

Will AI and ML take control of CRM?

Beyond the world of Alexa, AI and ML technologies are empowering a smarter breed of customer relationship management (CRM) tool.

Startups such as Conversica and Dynamic Yield have raised millions of dollars in funding on the promise that AI could improve the quality of sales leads and personalize offers for customers.

Companies like Humana and Aetna are using AI software from Cogito to train customer service workers to be professional and compassionate when dealing with angry and emotional consumers. The Cogito software uses a messaging window to send service reps texts about their performance, alerting them if they are, say, speaking too quickly or interrupting callers. Think of it as real-time customer sensitivity training – from a chatbot backed by cloud software that analyzes the tone, pitch and speed of speech.

Meanwhile, Boxever, a provider of cloud-based customer intelligence systems, is setting its sights on using AI to directly improve customer service. Targeting airline and travel companies, Boxever offers a tool that could, for example, recognize when an airline loses a passenger's bag and prompt the airline to notify the passenger via a chatbot, says CEO Dave O'Flanagan.

The software also uses neural networks to send customized email offers to customers based on their profile preferences. If someone doesn't respond to a certain type of offer, Boxever's system will make alternative suggestions in the future. In 2017, O'Flanagan says, the challenge for Boxever and other companies leveraging AI and ML to improve customer service will be to figure out customer intent. "Whoever cracks that," he says, "will be able to respond to customers in a more empathetic way."

"Unless you're really ***ambitious*** *and are trying to totally* ***transform*** *the business model, it makes sense to be more* ***conservative*** *and have a portfolio of projects that is less* ***dramatic*** *than trying to pull off a* ***moon shot****."*

–**TOM DAVENPORT**, PROFESSOR OF IT AND MANAGEMENT, BABSON COLLEGE

improve existing product offerings and monetize new ones, Olley says. In one example, the company used AI to extract medical images out of decades-old content, classify and annotate the material, make it searchable, and repackage it as a new offering in a matter of only four weeks, he says, noting that such an undertaking would previously have involved years of effort to unearth and assemble the relevant images.

The keys to more widespread application of AI, Olley contends, are making sure his technology team understands the organization's data and getting staffers up to speed on emerging AI capabilities. "Once they're trained in the art of the possible, they find new applications almost daily," he says. "Start small and it becomes a self-perpetuating engine."

Intelligent banking

Capital One, widely heralded for its technology-driven approach to banking, is already well down the path of using AI and machine learning to transform customer service and banking systems, says Adam Wenchel, the company's vice president of AI and data innovation. Last March, Capital One announced that it was integrating Amazon Alexa into its IT systems to establish a foundation for introducing new services that will allow customers to do their banking in conversational, hands-free ways, regardless of environment, Wenchel says.

In the future, Capital One plans to use machine learning to analyze call center conversations and identify major themes in an effort to improve customer service, detect fraud and identify new business opportunities. For example, that type of analysis could figure out which type of banking customers have a propensity to become investing customers, Wenchel says. In another example, Capital One is using machine learning to identify characteristics of a neighborhood or to uncover reasons why residents are moving into or out of areas to help optimize its home loan underwriting process in new and existing markets, Wenchel says.

Huge potential

GI Fridays also sees huge potential for AI, says Mityas. For example, beyond improving the customer experience, the data collected via the conversation platform could help the restaurant chain better understand its customers and their requirements. For example, data could be used to identify the most frequented social media forums to ensure TGI Fridays is actively participating in the conversations.

The machine learning capabilities go beyond traditional analytics in that the more data TGI Fridays collects on customers and their behavior, the more the technology gleans insights that can help the

"The beauty of machine learning is that it gives us ***guidance*** *beyond just the data. It becomes a* ***feedback loop****."*

–**SHERIF MITYAS**, CIO AND VICE PRESIDENT, STRATEGY BRAND INITIATIVES, TGI FRIDAYS

company tailor outreach or serve up specific offers in near real time. "The more we know about you, the more we can personalize messages and not just respond," Mityas says.

Already, customers are reacting positively to the higher level of engagement, he says. For example, TGI Fridays has seen a 500 percent spike in engagement with customers on social media channels since deploying the new conversation-based customer experience tools. It has also seen a bump in conversations initiating commerce activities such as ordering food or making reservations through social media platforms, he adds.

The same AI-driven capabilities have a lot of potential to help TGI Fridays develop future product offerings. "We are garnering consumer insights that can help us understand trends in taste, preferences for time of day to come in, or what kind of burgers are popular. We can feed [this data] to our culinary and marketing teams to create more relevant products," Mityas says. "The beauty of machine learning is that it gives us guidance beyond just the data. It becomes a feedback loop."

TGI Fridays also envisions gaining insights that can drive operational efficiencies by, for example, incorporating AI and machine learning capabilities into enterprise tools such as point-of-sale (POS) systems, Mityas says. "There's a lot going on within our four walls on a busy Friday night, from the front of the house, like how we allocate tables, to the back of the house, such as the flow of meals or what gets cooked," he says. "We can analyze all of that and learn how to run a more efficient restaurant."

The CIO's role

How successful TGI Fridays or any other company will be with AI technologies depends, in part, on the CIO. While line-of-business leaders can set up stand-alone systems piecemeal, an AI undertaking won't become a transformational initiative unless the CIO takes the lead to ensure that officials engage in the proper planning and strategic thought processes to support an enterprise view, experts say.

"CIOs who can recognize and figure out how to create business value are the ones that can position themselves across the enterprise," says Matthew Guarini, an analyst at Forrester Research. "CIOs need to be thinking about how to put the right road map in place, how to leverage data assets and how to get the right governance practices implemented."

You should start by identifying which business processes have cognitive bottlenecks and where fast, accurate decision-making can make a difference, especially those cases that involve too much data for humans to analyze or where it's too expensive to hire people with specific expertise, says Tom Davenport, a professor of IT and management at Babson College.

Davenport also advises CIOs to attack AI as a portfolio of projects. For example, they could do something in statistical machine learn-

ing along with efforts involving, say, chatbots, image recognition or speech recognition in cases where those types of technologies would meet specific needs. "Don't put all your eggs in one basket — start to learn what types of use cases make sense for what technologies," Davenport says. "Unless you're really ambitious and are trying to totally transform the business model, it makes sense to be more conservative and have a portfolio of projects that is less dramatic than trying to pull off a moon shot."

Building an AI team

Assembling the right talent is another critical component of an AI initiative. While existing enterprise software platforms that add AI capabilities will make the technology accessible to mainstream business users, there will be a need to ramp up expertise in areas like data science, analytics and even nontraditional IT competencies, says Guarini.

"As we start to see the land grab for talent, there are some real gaps in emerging roles, and those that haven't been as critical in the past," Guarini says, citing the need for people with expertise in disciplines like philosophy and linguistics, for example. "CIOs need to get in front of what they need in terms of capabilities and, in some cases, identify potential partners."

Dan Moross, director of customer experience at Moo.com, a provider of on-demand printing services, says he is pursuing AI in individual use cases, not yet as an enterprisewide initiative. For example, the company set out to improve customer self-service functionality by deploying a tool with AI-based text analytics and natural language processing functionality to update what was a static list of answers to customers' frequently asked questions. The system examines past visitor behavior to learn what is most popular and promotes relevant material to new visitors, Moross explains.

Moo.com is also using AI to tag and categorize feedback from customers instead of doing the process manually, which was a significant drain on employees' time. Since implementing both projects in late 2015, Moross says the company has seen a 20 percent reduction in chat volume as customers have become better able to help themselves.

Next up, Moo.com plans to evaluate using intelligent chatbots to improve its customer experience and will assess the feasibility of using machine learning to help agents guide customers to the right solutions. The idea, Moross says, is not to do something grandiose, but rather to focus on implementing AI when and where it makes sense.

"I don't think it's ever going to be 'Let's sit down and talk about how to use AI for business,' but rather 'What does the business need, and does that require something with AI?'" he says. "The technology won't drive what we do." ♦

Beth Stackpole is a frequent contributor to CIO.com.

> *"Once they're trained in the art of the* ***possible****, they find new applications almost daily. Start small and it becomes a* ***self-perpetuating*** *engine."* – **DAN OLLEY**, CTO, ELSEVIER

A clean start on brand loyalty

At Clorox, marketing and IT leaders work together on digital initiatives to help the company reach new customers through personalization.

BY CLINT BOULTON

Behavioral changes in modern commerce, exemplified by the shopping habits of millennials, are forcing consumer products companies to take a more targeted approach in efforts to build lasting customer relationships. That means crafting brand loyalty through personalization, and Clorox and other consumer products companies have found that it's not an easy task.

To address that challenge, Clorox pulled together a team of sales, product and IT leaders to experiment with novel approaches to marketing its wide-ranging lineup of products, which include Brita water pitchers, Hidden Valley salad dressings, Burt's Bees lip balms and much more. The so-called Sense and Respond team leverages social media, marketing software from leading vendors, and the internet of things (IoT) to help Clorox burrow more deeply into the consumer's consciousness.

"It's about giving the right message to the right person at the right time," says CMO Eric Reynolds, who works closely with CIO Manjit Singh to support Clorox's companywide strategy. "That transformation requires an enormous rethinking of data and technology and also in how we approach marketing."

Minding the consumer gap

"Enormous rethinking" is no overstatement. Consumer products companies sell their goods to retail giants such as Wal-Mart, Target and Amazon, which sell them directly to consumers. This

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business-to-business-to-consumer model means the companies that make the products don't see content and data created by shoppers, which challenges their ability to build brand affinity.

Companies like Clorox aren't built to deliver the instant gratification expected in an age where some businesses are discussing same-day delivery via drone. "When you're in an environment that is real-time and on-demand, and you want it to speak to you as an individual, that's a challenge for us because our model was built on mass and scale," Reynolds says.

Those challenges are compounded by the mindset of millennials, who, Reynolds says, tend to seek brands that share their core values and speak to them as individuals. "You can't count on your credibility as a large national brand as evidence of trust [anymore]," Reynolds says. "You have to work harder to tell people it is a product that meets their needs and comes from a company or brand that shares their values."

> "We collect vast amounts of data, and cutting through noise and finding relevant data is getting more and more difficult." – **MANJIT SINGH**, CIO, CLOROX

Clorox's Sense and Respond team is producing specific content based on consumer online activities and interests. It uses technologies from leading companies such as Facebook, Google, IBM and Oracle to track bread crumbs consumers leave as they visit websites, watch videos and purchase products. These tools help Clorox build social media branding and marketing campaigns, but they also create a lot of data, which is difficult for a company with dozens of brands to churn through.

"We collect vast amounts of data, and cutting through noise and finding relevant data is getting more and more difficult," Singh says. "And the technology to help you sort through that noise is still evolving." Even so, Clorox views predictive analytics as essential in helping it glean consumer insights and adapt to them in real time.

Tapping IoT technologies

Independent of the Sense and Respond team's activities, Clorox offered a glimpse of what may be an IoT-based future of commerce for consumer products makers last year when it rolled out the Brita Infinity, a smart water pitcher equipped with sensors that measure how much water passes through its filter and automatically orders more filters from Amazon. Singh says consumers can expect to see additional IoT-based offerings from Clorox.

The data generated from sensors could yield powerful insights for Clorox and other brands, says Charlene Li, founding analyst of research firm Altimeter Group. For example, smartphone sensors could eventually enable companies to triangulate exactly who is consuming a product by their proximity to it in a household. "If I could detect who is using a product, that begins to change things," Li says.

Reynolds says Clorox will go wherever it must to serve customers. "Our challenge," he says, "is to make sure that as shopping behaviors change that we are there." ♦

Clint Boulton is a senior writer at CIO.com.

Merging companies, merging tech

For CIOs, mergers and acquisitions take on a new customer relationship focus.

BY MARTHA ROUNDS AND ERIK BERGGREN

Businesses today are constantly forming and re-forming because of changes in customer behavior, new market configurations and competition from smaller, nimbler startups. And that means they have to be more willing than ever to take a close look at how they use mergers and acquisitions in their market strategy.

Continually making and breaking IT relationships is now integral to the evolution of enterprise systems, and managing the process

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of mergers and acquisitions has become one of the core challenges for business and IT executives.

"The nuts and bolts of due diligence haven't changed much in several years," says Mike Macrie, CIO of Land O'Lakes. An agricultural cooperative based in Arden, Minn., Land O'Lakes is in the midst of a merger of its crops input division with that of Iowa-based United Suppliers. In many cases, mergers are done for strategic reasons apart from companies' technology positions, says Macrie. But Land O' Lakes is exploiting the merger as an opportunity to serve its current and future customers.

Customer focus

"With respect to the integration of any two companies, we believe that consolidation and synergy realization is our No. 1 priority," Macrie says. However, he adds, there's "one important caveat: We must preserve the most unique and valuable customer interactions in both companies."

"With respect to the integration of any two companies, we believe that consolidation and synergy realization is our No. 1 priority." – MIKE MACRIE, CIO, LAND O'LAKES

Providing a unique digital relationship with customers, "is a significant competitive advantage," Macrie points out. "So, now we go into the integration planning cycle with more flexibility and a more open mind. We have a desire to consolidate, but we also focus on the customer's point of view, and how we can best support the customer experience."

A recent report by IDC, "Mergers and Acquisitions: Part 1 — M&A as an Innovation Strategy for Digital Transformation," says that a new aspect of the M&A journey is evaluating the strengths of both companies involved in the deal and what functions and applications should be moved to the cloud. The near-term promise of the cloud generally represents an investment in IT capabilities that return business value in the form of reduced costs, greater flexibility in provisioning services, and the ability to redirect freed-up resources to the strategic products or services.

This requires strong leadership from IT across business units — not just for new solutions and customer-facing products, but also for innovation within the IT infrastructure layer. Organizations need to invest in legacy IT and take advantage of cloud-based systems to develop portable workloads and reduce the need for extensive capital investments in hardware and platforms. Innovation and investments in core IT drive efficiencies and provide the business with more agile cost structures.

Reflecting on his company's recent mergers, Macrie says, "We've done a significant amount of work to preserve the best of each company. . . and we've worked especially hard to retain the capabilities in each company that touch the customer. Our approach to the back office focuses on speed and consolidation. However, the closer an application or system is to a customer, the more flexibility we have and the more time we take

> "The nuts and bolts of due diligence haven't changed much in several years." –MIKE MACRIE

to determine how to retain that functionality."

CIOs should imagine their businesses in future terms by recognizing that the cloud can transform business structures and even redefine what it means to be a business, in the following ways:

- **Enabling leaders** to divest themselves of business functions that can be provided more cost effectively by specialists.
- **Fostering temporary** and fluid organizational relationships, internally and externally, by connecting people through channels (e.g., avatars, smart interfaces) for transactional interconnections.
- **Removing the need** for staffers to work in the same office, enabling them to collaborate with one another remotely using mobile devices and social workflow tools.

Where will cloud initiatives find the biggest return on M&A-related investments? Business activities that offer the best opportunities include market expansion, business process improvement, reductions in overhead that lower the cost of sales, standardization of the service catalog, information gathering and data analysis, and customer experience applications. ♦

Martha Rounds is a research manager at IDC. Erik Berggren is a vice president of research with IDC's IT Executive Programs.

3 paths to analytics leadership roles

Companies are on the hunt for analytics executives, but where can they find talent in such a new field?

BY MURUGAN ANANDARAJAN AND DIANA JONES

In the past couple of years, organizations in all kinds of industries have created hundreds of new executive roles in analytics. Employers are on the hunt for leaders who not only understand the massive amounts of data at their disposal, but also are able to identify the threats and opportunities that arise as the analytics landscape evolves.

According to research firm Gartner, the role of chief data officer (CDO) is new to most organizations — more than 80 percent added the role in the last two years, and 60 percent of current CDO positions were created in 2015. So who are the people who have taken charge of analytics initiatives, and how did their professional experiences lead them to their new roles?

To find out, we studied the career trajectories of 38 analytics executives who were appointed in the past two years and featured in the Boardroom Insiders database. With titles such as chief data officer, head of global analytics, vice president for big data and senior vice president for insights and analytics, the group included males and females of various age groups and experiences spanning multiple industries.

We mapped all of the executives' career movements by identifying the first management function each of them held and then tracking all of their job changes prior to their most recent appointments at the helm of analytics initiatives. Our research shows that these executives landed their current positions by following one of three career paths: linear, nonlinear or parachute.

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Linear

Ten of the 38 executives progressed by a linear path — an upward movement within the analytics function. They may have followed a natural progression from statistics or machine learning to analytics, for example. People in this category had typically remained in one organization throughout their careers.

Fifty percent of these executives held master of science degrees in fields such as computer science, statistics or analytics. Common strengths included expertise in customer insights, data warehousing and machine learning.

Nonlinear

Seventeen of the 38 leaders had moved into their analytics executive positions via nonlinear career pathways, meaning they had previously held jobs in other disciplines. They had typically moved within and between analytics and functional areas such as IT, marketing and accounting. In this group, 56 percent had earned the highest degrees available in their fields of study and 38 percent held MBAs.

Common strengths of those who had followed nonlinear paths included the ability to take cross-functional approaches to problems and expertise in enterprise architectures, IT strategy, digital marketing and demand generation.

Parachute

Eleven of the 38 executives we studied had "parachuted" into their analytics leadership positions — meaning they had no previous experience in analytics. The people in this category had previously held positions in engineering and IT. Common strengths across parachute executives include knowledge of cloud computing, project management, mobile systems, telecommunications and security. Moreover, the parachute group is the one with the most doctoral degrees.

Career Pathway Type	Definition	Experience	Strengths
Linear	Direct upward movement in the analytics function.	Computer science, statistics or analytics.	Ability to glean customer insights; expertise in data warehousing and machine learning.
Nonlinear	Movement within and between analytics and related functions.	IT, marketing, analytics and accounting.	A cross-functional outlook; expertise in enterprise architecture, IT strategy and digital marketing.
Parachute	No previous work experience in analytics.	Engineering and technology.	Knowledge of cloud computing, project management, mobile systems, telecommunications and security.

Common traits

What this research shows is that there's more than one way to move into an analytics leadership position. Regardless of the route, all of the executives in this study shared these three characteristics: management know-how, the ability to identify potential value and holistic views of their organizations. ♦♦

Murugan Anandarajan, Ph.D., is department head of Decision Sciences and MIS at Drexel University. Diana Jones is assistant director, Dornsife Office for Experiential Learning, LeBow College of Business, Drexel University.

The art and science of the CPO

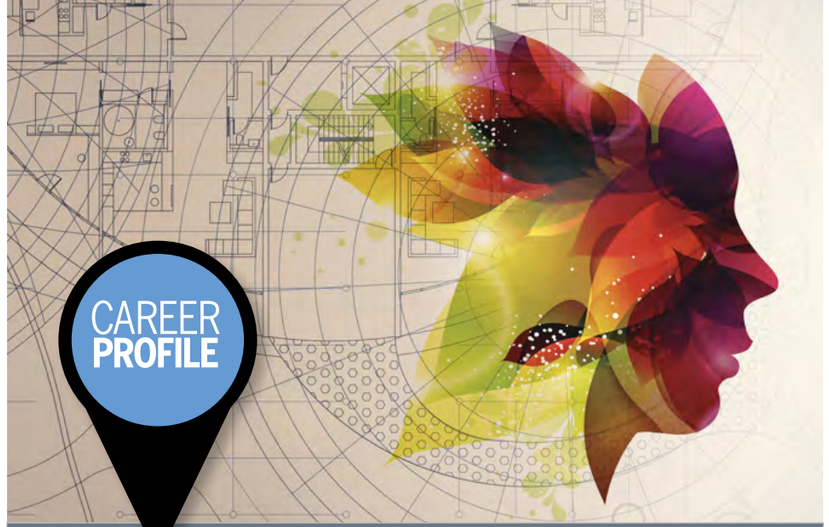
What does it take to prepare for, land and succeed in the hottest roles in IT? This month, we look at the multifaceted role of chief product officer.

BY SHARON FLORENTINE

Remember the Pontiac Aztek? The midsize crossover SUV/wagon/hatchback/sedan that debuted in 2001 was supposed to usher in a new era for General Motors.

It certainly was a distinctive-looking vehicle, but it also was one of the most ill-conceived and poorly received product launches in memory. What was supposed to herald a new, innovative and rejuvenated General Motors instead became a lesson — a lesson that still resonates today.

It's part of the job of a chief product officer (CPO) to help avoid spectacular failures like the Pontiac Aztek, says Tom Willerer, who's currently the CPO at online educational tech-



Chief Product Officer

ROLES	Chief product officer, head of product, vice president of product, UX designer, UX engineer.
MINIMUM EDUCATION	Bachelor's degree
RELEVANT AREAS OF STUDY	Communications, analytics, statistics, sales, economics, marketing, computer science.
TECHNOLOGY SKILLS	Software development, project management, design, art.
POTENTIAL EMPLOYERS	Organizations of all sizes in fields such as PR, advertising and marketing, education, consumer product and software development.
NATIONAL MEDIAN SALARY	**$179,728**

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nology company and MOOC provider Coursera. Aligning engineering, design and analytics with the larger business strategy and the demands of a digital-savvy customer base is tricky, he says, but it's fun.

Balancing act

"The Aztek example obviously isn't in the IT field, but it's one I think is really, really important for a CPO to remember," says Willerer. "You can actively solicit feedback from customers, and you can actively work within the needs of your organization — strategy-wise, budget-wise, innovation-wise — and you can still get it completely wrong. That's the balancing act, because there's a layer of interpretation that has to go over everything. People say they want X, Y and Z, but what they really want is Q, and you have to figure that out. It's sometimes more art than science."

"People say they want X, Y and Z, but what they really want is Q, and you have to figure that out. It's sometimes more art than science."

– **TOM WILLERER**, CHIEF PRODUCT OFFICER, COURSERA

Willerer began his career in advertising, cutting his teeth on projects for clients that served the enterprise market, like BlackBerry. He then moved to product-focused roles at Netflix, where he rose to the rank of vice president. He also worked in research at the streaming media giant. Across these roles, the underlying expertise he continually fell back on was an understanding of consumers' desires and behaviors.

Now, as CPO at Coursera, Willerer says he has a "fairly broad" role. "I lead design, engineering and analytics, though not in a technical sense," he explains. "My job is to take my deep consumer understanding and apply that to build a product to satisfy, delight and be useful to people all around the world. I'm constantly curating and executing a vision of what product means to Coursera."

Tech skills not required

Willerer has a bachelor's degree in business and a master's degree in media studies. And while he did take some technical courses that related to design and delivery, he had no idea that jobs like those he eventually landed even existed.

"When I graduated, I wanted to work in business because I felt that I could have a big impact on the world, and it seemed exciting. I was thinking I'd be a sort of creative leader, unlike what I thought was the norm in most traditional businesses, so I went into advertising. But when I interviewed at Netflix and the vice president of product explained what product roles were all about, it clicked — this was what I wanted to do with the rest of my life," Willerer says.

If you want to be a CPO, "it can be helpful to have a technical background, but it's not entirely necessary," says P.K. Agarwal, regional dean and CEO of Northeastern University, Silicon Valley. What's more important is the ability to effectively manage

the various departments that must work together to design, develop and build winning products.

"There are design folks, analytics and data folks, and engineering folks involved in the general 'product' space. They all have to come together even though they are fairly separate areas, functionally," Agarwal says. "So you need a CPO who can manage three different cultures and worlds of their own. The best CPOs are, in essence, mini-CEOs."

Willerer says you need to be adept in four critical areas in order to succeed in a product-focused role.

1 Vision. An understanding of the trends that are impacting potential customers is vital — as is insight into how those trends will evolve.

2 Communication. Explaining why a CPO needs communication skills, Willerer says, "I have to communicate very clearly to the CEO and the executive team where the product and the company is going, and I have to communicate the importance of the product and its vision to employees."

3 Structured thinking. CPOs need to be able to break goals and strategies into manageable chunks so they can efficiently manage projects that design and deliver products.

4 Design thinking. "You need to build a product that understands and uses consumer insight, but it also has to be polished and professional and have a deep aesthetic sense," Willerer says. "Apple is a great example of this kind of thing put into practice."

> **"You need a CPO who can manage three different cultures and worlds of their own. The best CPOs are, in essence, mini-CEOs."**
>
> –**P.K. AGARWAL**, REGIONAL DEAN AND CEO, NORTHEASTERN UNIVERSITY, SILICON VALLEY

Breaking the mold

Demand for product-focused professionals in all industries, but especially in IT, has never been greater and shows no signs of slowing, says Matt Leighton, director of recruitment at digital marketing and IT staffing firm Mondo.

Roles such as CPO, head of product and user experience (UX) designer are all "really hot," he says. And what they have in common is that they're all mashups that involve marketing and IT skills — especially software and applications expertise.

"These folks have to talk to customers, shareholders, finance, project management, internal marketing and development teams," Leighton says. "They all have to align with the mission of the company and the needs of the customer."

While Leighton says that most people that Mondo places in those jobs do tend to have technical experience, Willerer says there's room in the growing field for people with unorthodox backgrounds.

"Part of this is understanding how to make things that delight people, and that means breaking the mold," Willerer says. ♦

Sharon Florentine is a senior writer at CIO.com

RESOURCES

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7 Myths of AI Content Hub

When it comes to AI and its applications, there are a number of myths being perpetuated by the mainstream media. These resources will help you dispel these myths and discover that the opportunity to apply AI to your business is real.

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Essential CIO Guide to AI

With the topic of AI has reached such a fever pitch in the media, it's only a matter of time before every CEO starts asking their CIO "What's our AI strategy." This e-book serves as a primer for CIOs wanting to get to grips with the topic of AI.

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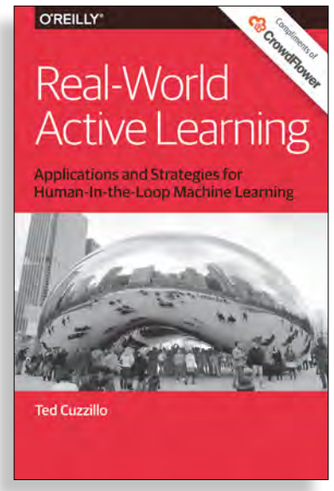

Real World Active Learning

Machine learning isn't a set-it-and-forget-it operation. In this report, industry analyst Ted Cuzzillo examines real-world examples of active learning and the point at which algorithms fail and human judgement can improve an algorithm's performance.

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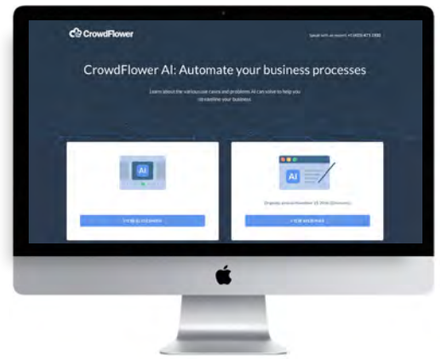

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