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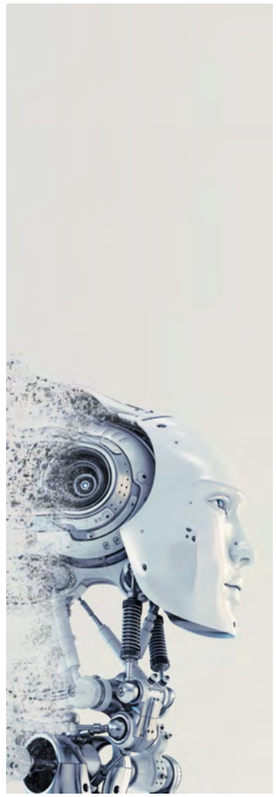

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LETTER FROM THE PUBLISHER

We don't naturally associate "vulnerability" and "leadership." Yet throughout my career, the leaders who inspired me most were the ones who were authentic, appreciative, and candid. Who asked questions rather than dictated. Who exemplified the "whole self" culture we're fortunate to explore with Mike Robbins, an expert in teamwork, leadership, and emotional intelligence, as a contributor to our second issue of NEXT (page 30).

Strong leaders also have a knack for anticipating business and technology shifts, and the courage to embrace new ways of operating. Today, many IT leaders are grappling over the impact of the multicloud era, where there isn't just one cloud but many clouds — public, private and distributed. Which cloud strategy will make their companies more agile and give them a flexible platform for the future? (page 38). Where should they apply Machine Learning for a competitive edge? (page 34). And how can they ensure business continuity, even in the most extreme conditions? (page 42).

Finally, some of the most innovative leaders seek ideas and inspiration from creative places. In this issue, Fabien Cousteau shares his view on aquanautics as a way to think about digital transformation (page 56). And Mick Ebeling inspires us that even the seemingly impossible can be possible. We all have the ability to make miracles happen (page 48).

How can you embrace vulnerability, harness the changing digital atmosphere, make the impossible, possible? Read on…

Julie O'Brien
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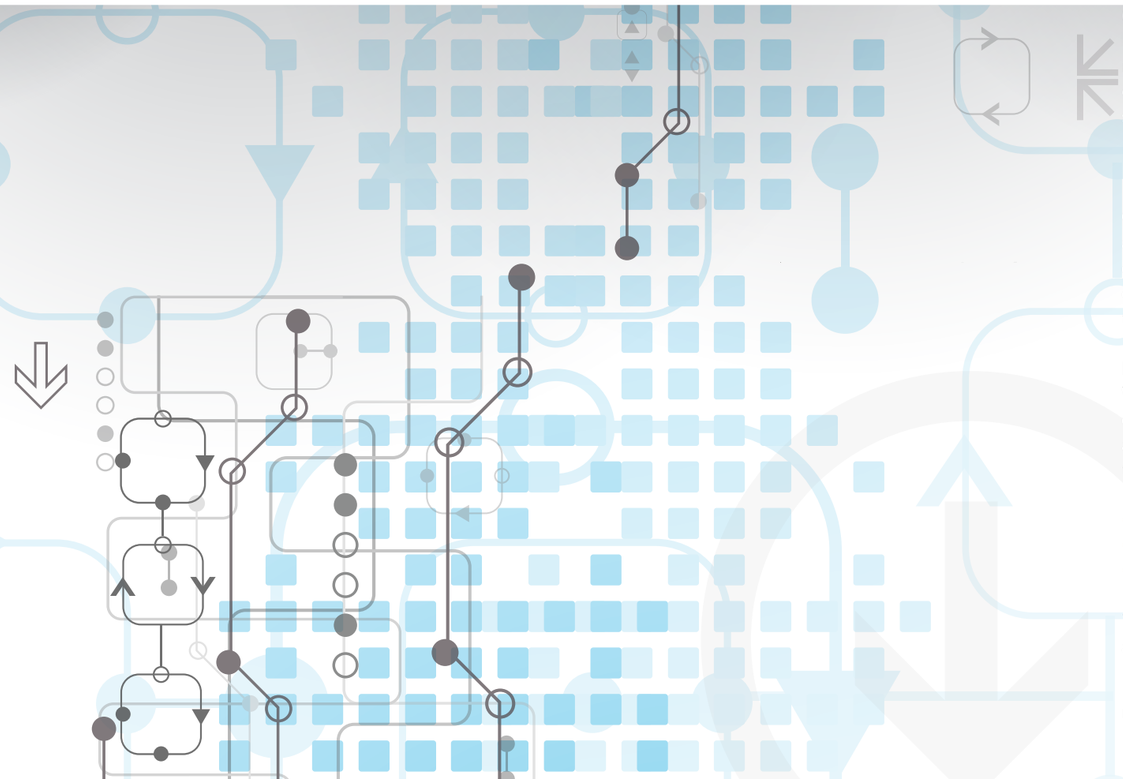
OPINIONS

CLOUDIFICATION AND THE ROAD TO DIGITAL TRANSFORMATION

BY MIKE D. KAIL



Digital business transformation and cloud migration are top of mind for every CIO in every industry around the globe. If they're not key strategic initiatives in your organization, they should be. And quickly. Advancements in technology and an incessant onslaught of nimble new digital-native companies are rapidly changing the competitive landscape. Customer expectations are changing too. The digital age has empowered a generation of savvy, discerning consumers demanding faster and better experiences and services for a lot less money.

In some respects, the cloud and everything it entails is an enabling technology for digital transformation. IT organizations are modernizing their application landscape in an effort to deliver these richer, more rewarding customer experiences. Cloud computing offers the agility, flexibility, and cost-effective scale needed to compete in today's modern digital economy.

A WORD ABOUT CLOUDS AND VIRTUALIZATION

Just so we're clear, when I say cloud, I'm not talking about consuming applications from someone else's data center, as in the software-as-a-service (SaaS) model. I'm also not talking about virtualizing a few on-premises workloads. While "virtualization" and "cloud computing" are often used interchangeably, they are different, albeit complementary, concepts. Cloud computing refers to the delivery of infrastructure (such as network, compute, and storage) resources on demand, either over the Internet (public cloud), in the enterprise (as a private cloud), or both (hybrid cloud). By decoupling the delivery of these resources from the underlying hardware, virtualization gives cloud computing the agility, elasticity, and economies of scale we typically associate with the cloud.

FOCUS ON THE JOURNEY, NOT THE DESTINATION

Cloudification is the process of migrating your on-premises applications and workloads to cloud infrastructure. When doing so, it's wise to focus less on the specific destination of those workloads and more on your reason for the transformation in the first place.

For those Simon Sinek fans, this would be the "Start with Why" approach, in which you initially lay out a set of questions and answers describing the desired outcomes and future ongoing states. Some of the desired outcomes that I have documented in the past include:

- Scalability improvements
- Storage optimization
- Improved security controls

These outcomes will all need to be continuously monitored and tracked to show initial and ongoing efficiency gains.

Once you have completed your Q&A, start your cloudification journey by developing a strategic plan that takes into account all the required changes—cultural, organizational, and architectural—and do not underestimate the "cultural headwinds" you will encounter. This way, not only will your cloudification initiative make more efficient use of cloud resources and result in higher-performing and more cost-effective apps—it will also help transform your entire business.

MAKE THE TAILWIND STRONGER THAN THE HEADWIND

Change always brings with it a certain level of fear, uncertainty, and doubt (FUD). Big cloud initiatives tend to ratchet up the FUD factor. Talk of cloud migration or automation often has the halls of IT whispering with fears of layoffs or jobs going away. The truth is that all of us—especially those working with technology—need to continually evolve our skills to learn and adapt to the ever-changing digital landscape.

Knowing this, you can proactively change the culture of your organization in preparation for the changes to come. Here's a simple framework that I've used many times to create a tailwind of enthusiasm and trust that will beat out any headwind of doubt:

- Assemble a cohesive leadership group
- Help articulate what the upcoming change means for the business and people
- Collaborate on the overall plan and ensure that it has clarity
- Communicate the plan to the broader team
- Continue to communicate the plan

There is no such thing as overcommunicating. Constant communication may seem tedious and a bit redundant, but it provides assurance that everyone continues to be aligned and is working together.

As I said, it's a simple framework. But it works. There's no need for overengineered processes to launch your cloudification journey.

STONE WALLS ARE GREAT UNTIL SOMEONE INVENTS GUNPOWDER

One of the strongest headwinds you're likely to face will swirl around the topic of cloud security. Or, more precisely, the lack thereof, which many a change-averse colleague will be all too happy to point out. Well-defined hardware-based perimeter security enforcement feels like a high-walled fortress compared to the porous, software-defined, elastic perimeter of the cloud.

The fact is, innovations such as mobile devices and edge computing have already rendered old-school perimeter

security obsolete. Applications are the new security perimeter. The multicloud networks we use to run our businesses have exponentially stretched the attack surface, as well as the ability of traditional security paradigms to protect our data.

The best way to deal with your security headwinds is to refute cloud security doubts with open and pragmatic discussions regarding the real challenges, and the need for a new approach to security in cloud computing environments. There's a reason why people stopped building stone walls after the invention of gunpowder.

WHILE YOU'RE TEARING DOWN WALLS, LOSE THE ONE AROUND YOUR SECURITY TEAM

This new security perimeter and expanding attack surface are also ever changing. Mobile users can appear and disappear anywhere on your network. Developers and Ops teams can turn up new machine instances anytime, anywhere. Containerized application data may be needed one minute and deleted the next. Combined, these new dynamics will require complete visibility into security controls and infrastructure changes, as well as continuous assurance that changes have not introduced any new vulnerabilities.

Thankfully, there are several emerging yet proven technologies that were brought to market to specifically address this new elastic, ephemeral world. Some keywords to use in finding the correct solution partner include:

1. Continuous compliance
2. Intent-based security
3. Microsegmentation
4. Application discovery
5. DevSecOps
6. Service insertion and service chaining

A mad race to the cloud will leave your security teams and controls behind, and your data vulnerable. A better approach will be to address security concerns at the very beginning of your planning and at every stage in the process, and come up with a strategy that protects not only north-south traffic that comes in from outside the data center, but also the east-west inter-application communication. Just as DevOps has helped usher in the era of continuous design, test, and deployment, integrating your security team into the development and delivery cycle will be a requirement for successful cloudification. Consider embracing a collaborative DevSecOps framework as a baseline component of your cultural transformation.

DISRUPTION FAVORS THE BOLD

We have already seen major incumbents, as well as entire industries, being swallowed whole by agile digital newcomers. Digital disruption is a clear and present danger. But it doesn't have to be that way.

We all have access to the same technology and tools. Yes, digital transformation and cloud migration will require massive changes—in everything from corporate culture and organizational structure to the way we architect networks, develop applications, and select new tools.

But fortune favors the bold. Don't let fear of change or your own cultural inertia stand in the way of your bright digital future in the clouds.

ABOUT THE AUTHOR Mike D. Kail is co-founder and CTO of Cybric, a Boston-based security-as-a-service startup. Formerly CIO at Yahoo, Mike was recently named by Huffington Post one of the "Top 100 Most Social CIOs on Twitter." You can follow him **@mdkail.**

IN SPITE OF THE MONSTERS

By Wendy M. Pfeiffer

Fear, diversity, and the importance of belonging

When I was a little girl, bedtime was a frightening experience. I was afraid of the dark. I was afraid of the monster that most assuredly lived in my closet. I suffered recurring nightmares of epic proportions. But looking back, what I remember most were the reassuring words of my parents each night as they tucked me into bed: “You are a child of God, a cherished daughter, and a necessary member of our family. In such good company, what harm could possibly come to you?“

Now that I have children of my own, I understand how brave my parents were. While my monsters were imaginary, theirs were real. How are we going to pay the mortgage? What if we lose our health insurance? How much safety can we really promise beyond the four walls of our home? Whether they were sick, discouraged, insecure, or scared made no difference. Their words of comfort and belonging arrived each night, giving me the time and space to calm down, and a safe place to dream and thrive.

Today, my husband and I have the privilege and responsibility to provide that same sense of security and belonging for our children, despite our own fears, failings, and insecurities.

FEAR, SEXISM, AND OTHER GROWN-UP MONSTERS

Coming up through the IT ranks, I faced many scary moments. Like many technologists, I'm a natural introvert. I was terrified of public speaking or even having dinner with the senior leadership team. I was usually the only female in the data center or the boardroom, and it was often made painfully and publicly clear that I was not welcome in the boys' club.

Once, while I was in the middle of an admittedly horrific implementation presentation, an entire room of male senior executives burst into laughter. One by one, they left the room while I was still speaking. (I still have no idea what it was I said).

Early in my career, I spent a cold December night on a bench in downtown Detroit because I got lost driving to my hotel and locked myself out of my rental car. Business travel was new to me. I was young, and more than a little scared. Detroit's finest eventually helped me out, but not until I successfully convinced them that I was not "plying my trade" in the park.

I still painfully recall watching the monitors in Yahoo's network operations center as entire countries dropped offline after my team executed a "simple" change request. One of the senior guys turned to me and asked, "What do you have to say for yourself, Princess?"

IT'S SCARIER AT THE TOP

Through all of these uncomfortable moments, I girded myself with the notion that once at the top, I'd have nothing to fear. I would have proven myself. I would set the strategy and budget. I'd only travel business class. And I'd be surrounded by fellow executives who trusted and admired me.

I'll wait for you to stop laughing.

Of course, the reality of leadership is quite different. I've learned that C-level positions are even less safe and secure than middle management. We're exposed at every level by forces both internal and external: the market, competition, product challenges, financial issues. Every decision we make is magnified, and each of our failures has broader implications for the many people affected by the outcomes. Real people with families and mortgages who count on us, not just for their livelihoods, but for their reputations and feelings of self-worth. Pretty scary stuff!

A LESSON IN VULNERABILITY

As a leader, I am often called upon to speak about inclusion and diversity and any number of other topics important to our company. The other night, as I was putting my kids to bed, I told them about an upcoming business trip, which included a series of public speaking engagements. I'd be presenting in front of 400 channel partners over the course of 48 hours. Me, the introvert.

Sensing my apprehension, they immediately jumped in to comfort me—the same way my husband and I comfort them when they call out in the night. They said, "Mommy, you have nothing to fear. You are a Pfeiffer, a member of this family. We believe in you—even though we don't always understand what it is you do. No matter how it turns out, you have this safe home to come to. You belong here, you're one of us, and we'll be waiting to welcome you home."

And in that moment, it struck me. Our industry's quest for more diversity and inclusion doesn't require special programs or quotas. I don't need any more training than my parents' wisdom echoed back to me by my own children.

As a corporate leader, I am responsible, regardless of circumstances and regardless of my own fears or shortcomings, for making my company a safe, welcoming, and inclusive place for all of its members. Only by speaking and modeling this sense of belonging in each one of my interactions, decisions, and plans can I create the safe space required for my team members to thrive and grow.

Just as it was for my parents, it's the job that we, as leaders, signed up for. Whether you're worried about paying the bills or speaking in front of 400 channel sales partners, you show up. You muster the courage. Despite your own fears and failings. In spite of the monsters.

About the Author Wendy M. Pfeiffer is the CIO of Nutanix, where she leads the global Information Technology team and functions that support the company's business operations and employees. Prior to Nutanix, Wendy led technology teams for industry-makers like GoPro, Yahoo!, Cisco Systems, Exodus Communications and Robert Half. @WendyMPfeiffer

Scaling the Startup

BY BOB DUSSAULT

ADOPT A DEVOPS MINDSET FOR A SUCCESSFUL TRANSITION

Your customers don't care if you're small. When they report a problem, they want it fixed. When they ask for a new feature, they want it delivered as soon as possible. For the resource-constrained startup trying to mature, this can pose a significant challenge. You need to introduce more process and standards to ensure quality, resiliency, and security as you scale. But at the same time, you can't afford to squelch the innovation and agility that led to your earlier success.

THROUGHPUT WITH QUALITY

I lead IT operations for a fast-moving educational software company. We're also a startup, with all the associated goals and challenges: commercialize as fast as possible, but with all the control and assurance necessary to meet customer expectations for the product. Then scale like hell.

Like most startups, we run lean, so adopting a platform as a service (PaaS) strategy gave us the economies of scale and ability to quickly spin up and provision the resources we needed to commercialize what began in a university lab incubator. We use Amazon Web Services (AWS), but thanks to our DevOps mindset and the process I'm about to share with you, we're not locked into any one vendor or platform that could limit our vision or ability to innovate.

That would be a constraint, and that's the number one enemy of the DevOps mindset.

WHAT IS THE DEVOPS MINDSET?

The DevOps mindset focuses everyone's attention on one thing: removing all constraints from the value stream that produces meaningful things for your customers and your business. Nothing is sacred. Not culture. Not process. And definitely not tools.

To identify the constraints and make the right choices for accelerating value now and in the future, we developed the following framework:

1. Understand what we have
2. Know where we want to go
3. Start from the top down: culture, architecture, processes, then tools
4. Experiment, fail fast, and codify our successes

Here's a brief run-through of what that looked like for us.

1: Understand What You Have and What You Can Let Burn

Before making changes, we first needed to understand what we really had. Most of what we had was in our CTO's head. So for us, the first order of business was to get everything documented and to determine our level of resilience and scalability. When you're running fast, you often leave a trail of technical debt. To find the time we needed to mature our DevOps value stream, we made a conscious effort to fix only those issues that had a meaningful impact on customer experience or were critical to our ability to deliver services. These were quick conversations. Is it important, or can we "let it burn"?

2: Know Where You Want to Go

Our firefighting efforts bought us two things: a reasonably resilient and stable minimal viable product, and the time we needed to plan and implement the fully realized vision our founders intended. We hired a product strategist, reviewed all the capabilities and features that our founders wanted to get into the real world, and laid out our product and software roadmaps. Then we compartmentalized features and upgrades into bundles that were easier to digest and pushed them into our systems development life cycle so we could deliver them in a predictable manner.

3: Start from the Top Down

Once you have your roadmaps in place—and they don't have to be very detailed—you can begin to focus on how to get there. This is where you will start to see the constraint points in your value stream. Constraints can be removed through culture, with processes, with tools, or with a combination of these. But you won't know until you start experimenting. And you can't experiment until you ask yourself some questions. You're still not talking about tools. These should be big architectural questions:

- Based on our product roadmap, how might we need or want to change our technology stack?
- Is our database architecture scalable?
- Where does it make sense to look at our own data center versus a hosted service?
- Should we use a different application framework?

The answers can be found through the lens of your own constraints. For instance, we knew we had an issue integrating with school information systems. One way to solve this issue would be to use application segmentation, by writing a microservice focused on that single task. Moving to a microservices architecture would mean fewer restrictions on where these loosely coupled, containerized apps needed to reside. And that decision would have a direct impact on our platform strategy and the notion of vendor lock-in I mentioned earlier.

Our entire journey is framed around adding automation into the value stream. We had to get to the point where the developers were not waiting on operations to deliver new services. But there was still the issue of security and compliance. Do we allow people to push directly into production, or should there be gates? So we were very interested in infrastructure as code, and in change control with automated assurance.

Automation removes ambiguity from a process. When you spin up an Amazon Elastic Compute Cloud (EC2) server

based on a configuration articulated in a job ticket, it may or may not meet the needs of the task. But if you create a cloud formation stack and write a script with a "deploy this when that" trigger, you know what you're going to get every single time.

You can apply this level of automation to development and integration testing as well. By having trust early in the development cycle, you can increase agility and quality, and the back-end constraints start to fall away.

When you view your existing processes through the lens of your constraints and the ideals of your product roadmap and cultural pillar, ask yourself: Do our processes still make sense? If they don't, move on. If they do, it's time to experiment.

4: Experiment, Fail, and Codify Successes

Our CTO has a PhD in data analytics and follows a rigorous scientific method when experimenting with potential big data solutions. The methodology I follow in operations (and am helping to push into development) is a bit more straightforward:

- What is the business need?
- Does the solution fit within our roadmap vision?
- Is it practical from a logistics standpoint?
- Is it cost-effective?

Cost is the least important factor. If it works, we know it'll save us money in the long run, because we'll get more done. If the experiment fails, you move on quickly. If it succeeds, you have something you can codify into a new published process.

A WORD ABOUT TOOLS

Tools are important, but they're just that: tools. They're meant to serve you, not the other way around. We use Jira for job ticketing and tracking, but we don't let limitations with Jira dictate changes to our workflows. If the tool doesn't remove a constraint, or if it creates new ones, you need a new tool. There are no sacred cows.

Ultimately, the DevOps mindset is about going back to basics—to the principles of customer focus, agility, and that single-minded determination to knock down obstacles to success. You do that by understanding your value stream and the constraint you're trying to solve for. Then ask yourself questions, starting with architecture and frameworks and then moving on to individual processes and tools.

We love the kanban board tool Trello. Yet here I am with our director of engineering, sitting cross-legged on the floor, staring at a bunch of Post-it notes on the wall. It works. And we have plenty of Post-its and a lot more wall.

About the Author Bob Dussault is Senior Director of Data Center and Technical Operations at FastBridge Learning. Or as Bob puts it, "an infrastructure guy who has spent the last ten years figuring out how best to provide secure and agile resources for a software-as-a-service (SaaS) provider."

Toolbox

The tools you use will be unique to your needs. In case you're wondering, here's what we're experimenting with:

- Continuous integration (CI): Jenkins
- Version control: Switched from Subversion to Git to work in a distributed fashion
- Build agent: Maven
- Test automation: Selenium
- SQL schema consistency: Redgate SQL Toolbelt
- Structural administration: Kubernetes and Puppet
- Monitoring and metrics: New Relic and Google Analytics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BUSINESS

LEADERSHIP THROUGH LIFECYCLES

By John McAdam

Companies, private and public alike, exist in dynamic environments. They're subject to a variety of internal and external variables that impact their business. Conditions fluctuate. New markets emerge. Existing markets evolve. With technology ever advancing, some become obsolete.

We've all heard it said: The only constant is change. Businesses must adapt to market fluctuations to remain relevant—and this adaptability, this recognition of changing conditions and the need for strategic, nimble response, starts at the top.

I call this ability to adapt "leadership in the moment."

I've led companies as a hands-on CEO and executive on the front lines, and more recently as a board member for a number of innovative organizations where I consult as part of a multidisciplinary leadership team. Through my long career, I've come to understand how vital it is for company executives to adjust their strategies and leadership styles depending on the unique phase of the business lifecycle they find themselves in.

Here's some of what I've learned.

THE SURVIVAL PHASE

Being brought in to lead a company that is struggling to survive is akin to boarding a plane that's about to crash. The pilot is unconscious, and you're nosediving to the ground. This is not the time for grand speeches and visionary mission statements. It's a time of swift, decisive action. You're not there to resuscitate the captain or comfort the crew. You grab the controls and do whatever it takes to save the plane and all the souls on board.

In the survival phase, speed is paramount. In fact, survival should be the shortest phase as you quickly take the necessary actions to stabilize your company. It's also the phase of tough decisions, where layoffs and downsizing are common. While it's critical to act quickly and decisively, you must do so with integrity and compassion. Not only is it the right thing to do, but it's important in helping "surviving" employees move past this necessary but painful period with the right attitude for success.

It's essential that you remain visible to all stakeholders, act transparently, and communicate clearly—and often—throughout the survival phase. At the same time, you need to be working on plans B, C, and D. You may not want to think about an alternate exit in the event of catastrophic failure, but it will be worse for everyone involved if you don't. So you plan and act for the best, but prepare for the worst.

The takeaway? As the leader, you must be ready to make the hard decisions, and make them quickly, compassionately, and transparently. Believe the approach you're taking is the right one for the survivability of the company, and demonstrate resilience to everyone around you.

THE STABILITY AND BUILD PHASE

When you emerge from survival and move into the stability and build phase, look at the circumstances that brought you to the brink and view them as opportunities to help you plan and execute your next moves.

This is your chance to rearchitect your company—from the market you're targeting to your product innovation and strength, to your sales approach, and to your commitment to customer support and satisfaction. Recognize and acknowledge any mistakes, and recommit to the passion and vision that started your company in the first place. Redefine your market to ensure that there's a viable path forward. Reinvest in your products and your people. You need a team around you that you trust, a team capable of taking your company into the future. And remember: turnarounds take time, so be realistic and patient. Your company could be in this phase for two or three years.

The takeaway? Transparency and open communication are everything. Again, be visible and communicate clearly and often.

THE GROWTH PHASE

When your company stabilizes and moves into the growth phase, you'll want to adjust your leadership approach again. This phase is inspirational and, for a leader, very hands-on.

It's about planting new stakes in the ground. Demonstrating your expertise to customers. Growing your installed base. Keeping a step ahead of your competition. Identifying the next big thing and how your company can get in on it.

Make sure everyone in your company clearly understands the objectives. Is there a plan in place to scale? To develop new partnerships? How will you continue innovating? Expanding your market? Will you prioritize organic development, or will you consider mergers and acquisitions? If the latter, how will you ensure that a merger or acquisition succeeds and that all employees adjust, both existing ones and those joining during the transition? You'll want to make sure company culture doesn't suffer during a merger, or as you begin aggressively recruiting again. During the growth phase, you must set the example you want your employees to follow, from the top down—because your company's culture starts with you.

The takeaway? Inspiration and innovation will guide your decisions and actions. Be passionate and determined. It's contagious.

FOR ALL PHASES

What cuts across all these phases? A singular focus on customer satisfaction and, ultimately, customer loyalty.

You get satisfied customers by meeting their expectations for quality and service. But you earn their loyalty—a much more valuable commodity—through continuous innovation. Customers become advocates when they buy into your vision and product roadmap. They become zealots and brand champions when they can't wait for your next new product or update.

It's vital that you as a leader demonstrate your understanding and appreciation for your customers' unique business challenges and requirements. Underscore with them your company's ongoing commitment to maximizing their investment in your solution through world-class support and continual innovation—particularly when you meet with CIOs. Show them you understand their mission-critical operations and concerns, and how your solution underpins their success. Whenever possible it's best to emphasize this commitment in person, especially when meeting with C-level executives. Keep in mind with international customers that requirements and regulations differ by geography, so be sure to prepare thoroughly through prebriefings.

PARTING THOUGHTS

Whether you're a leader pondering your next move or a rising star ready to try on the CEO mantle, here are some final things to consider.

I've had the privilege and pleasure of leading as a CEO, executive, or board member of both private and public companies of various sizes, and each offers unique environments to learn and grow. Private companies benefit from a certain level of autonomy and, when led by a strong leadership team and board with a clear-eyed view of the potential market, can be a thrill ride of nimble, customer-driven decision making, innovation, and execution. And, it's enlightening to see how a company operates differently before, during, and after an IPO. Public companies must prioritize these same requirements for agility, plus you have the additional challenge of balancing your actions and company strategies against shareholder interests and stricter operating regulations.

You may want to give serious consideration to joining a company board. A board position can offer executives an entirely new perspective regarding company lifecycles and market expectations.

Additionally, as executives we need to remember that every decision—whether a mailroom hire or a major R&D investment— must be well defined, well executed, and always in the best interest of the company, its customers, employees, and shareholders. The leadership decisions we make have lasting impact.

Regardless of where your next move takes you, every company requires a leader who can quickly and confidently adapt management strategies to changing market conditions and business lifecycles. Remember, it's your courageous "leadership in the moment" that will guide you and your company through each successful transition in the lifecycle of the business.

ABOUT THE AUTHOR John McAdam currently serves on the board of F5 Networks, and was president and CEO from 2000 to 2017. Under his leadership, F5's annual revenue grew from $100 million to $2 billion. Prior to F5 he was GM of IBM's web server sales business, and president and COO of Sequent Computer Systems. John currently serves on the Nutanix board of directors. He has received numerous industry awards for his leadership, and holds a B.S. in Computer Science from the University of Glasgow, Scotland.

WHAT WILL THE NEW CIO LOOK LIKE?

A CHANGING WORLD WILL REQUIRE CHIEF INFORMATION OFFICERS TO HAVE A DIFFERENT SKILL SET

BY MARTIN VEITCH

There is an ancient (and not very funny) joke that relates to the CIO role, suggesting that the term stands for "career is over." Boom-tish! I'll be here all week…

The jest dates back to when the enterprise data center was the limit of most IT leaders' ambitions and IT itself was regarded as a back-office requirement rather than a source of innovation or strategic differentiation. Most IT chiefs were computing specialists, accustomed to reporting to CFOs who in turn viewed technology budgets with suspicion but lacked the tech savvy to question them too deeply. The result was a stalemate that was satisfactory for few.

Over the years, and especially as the web started to change the world, IT started to be looked at in a different way, and the CIO role became more prized. Top CIOs enabled new strategies, created new channels to market, helped the organization reengineer, built new collaboration and communications routes, and led the way on new transactional systems.

But today the CIO role is once more being questioned, and it is not as clear-cut as it once was. Organizations pour vast resources into technology, and the CEOs of companies such as GE and Goldman Sachs like to refer to themselves as heads of software companies. "Software is eating the world," Marc Andreessen says, and many of us agree. Whether you're making cars, selling investment schemes, trading shares, operating bank accounts, providing private-hire cabs, selling groceries, or running haulage fleets, you're in the digital business.

These companies hire chief digital officers that work with CMOs on marketing, chief data officers that crunch numbers to gain insights, CISOs that specialize in security, and so on. At the same time, freshly minted CEOs, CMOs, COOs, and CFOs are often pretty knowledgeable about technology. They have smartphones and tablets and use dozens of websites; often they'll take the lead on purchasing the latest sales and marketing tools. Where does all this leave the CIO? "Feeling a little squeezed" might be the polite answer.

My sense, based on meeting thousands of CIOs over the years, is that today's models are very different than the ones I met 25 years ago, and that they are still reinventing the role to suit present needs.

In the face of this new world of constant change, CIOs need to reinvent themselves. Here are some qualities that I think will become characteristic of successful CIOs.

Polyglot and multilingual. The globalizing nature of business means that CIOs will need to have (or add) linguistic and cultural understanding to take advantage of a worldwide skills pool, gain the benefits of offshore development, target new and emerging markets, and extend value chains.

Emotionally intelligent. As IT becomes more closely integrated with sales, marketing, logistics, the supply chain, and other lines of business, harnessing teams of (mostly male, often introverted) developers, architects, and administrators won't be enough. IT will also be working alongside data scientists, governance experts, and security and privacy experts, and so deep emotional intelligence, as well as communication and people skills, will come to the fore.

Cross-skilled. For the above reasons, CIOs of the future will need to be all-rounders and have experience in working in other departments of the organization.

Always learning. Rules such as the EU's General Data Protection Regulation (GDPR) and other changes in the data protection and privacy landscape mean that CIOs will have to be adaptive and willing to learn about non-IT matters that touch technology infrastructure. Governance is an obvious adjacent area, but being generally open and listening will be fine attributes to possess.

Long term but short term. Studies have shown that the average tenure of a CIO tends to last for three to five years (4.3 years, according to a recent study by the Korn Ferry Institute). But if they are to move upward to COO and CEO positions, CIOs will need to show they can build a legacy that takes organizations forward. The suspicion is that some CIOs seeking to make a splash as "change agents" will make sweeping changes and then depart quickly, leaving others to clean up their messes. CIOs with ambitions for larger roles might be better off fostering a reputation for sticking around and accepting challenges while showing their capacity for iterative change.

Communicative. CIOs today need to speak to their staff, other employees, C-suite executives, and peers. In the future they might need to be able to communicate effectively with the public and with shareholders as technology differentiation becomes even more important. But even the most charismatic CIO can't be in more than one place at the same time, and their evolving role means they will need to make strategic decisions on deploying conferencing and collaboration tools. From Slack to telepresence rooms, they should lead the way forward in using technology to get the most out of their organizations' most valued assets—people.

The CIO who can tick off all these boxes will be well positioned to show that CIO need not mean "career is over." On the contrary, the modern CIO will be a prime contender to become the next CEO.

ABOUT THE AUTHOR Martin Veitch is a freelance writer on business and technology, and a former editor In chief of CIO magazine in the UK.

“WHOLE SELF” CULTURE KEY TO THRIVING ORGANIZATIONS

By Mike Robbins

How does a culture of healthy, high expectations, balanced by nurturance, enable individuals and organizations to achieve greater fulfillment, competitive advantage, and success? How can companies create an environment where their employees feel safe and encouraged to take risks, give more of themselves while maintaining balance, and deliver results? And what does it mean to individuals to bring their “whole selves” to their work?

My new book, *Bring Your Whole Self to Work*, is scheduled for release in May 2018. In it, I examine what I’ve learned over 17 years as a researcher, writer, and speaker regarding workplace dynamics and how an environment of authenticity, healthy risk-taking, and support helps both individuals and companies thrive.

When we enthusiastically challenge our employees to bring their best—their whole—selves to work, we and they reach new, higher levels of creativity and performance. Individuals’ passions and talents are engaged. They connect—with their own aspirations, and with others. As they do, teams and organizations push farther. Reach higher. Grow and succeed.

But individuals need to feel safe to bring all of who they are—and that takes courage. My experience and research has shown that when we nurture and support employees, their fulfillment influences those around them to aim higher for the organization's collective success.

Consider implementing these steps to help attract and retain employees committed to personal and organizational growth and success.

FIRST: Encourage your employees to embrace their vulnerability. We erroneously think being vulnerable is a sign of weakness. It's not. Vulnerability can be scary, but it's essential to encourage healthy risk, change, creativity, collaboration, growth, and results.

Dr. Brené Brown of the University of Houston says, "You can't get to courage without walking through vulnerability."

NEXT: Encourage your employees to have "sweaty-palmed" conversations. A mentor once said to me, "Mike, what stands between you and the kind of relationships you really want is probably a ten-minute, sweaty-palmed conversation you're too afraid to have."

Too often we avoid conflicts with others because we're afraid of the consequences that come with speaking up. Yet when we muster the courage to start those sweaty-palmed conversations, we strengthen our ability to resolve differences while deepening our connections, building confidence, and contributing to collective success.

REMIND YOUR EMPLOYEES TO: Stop trying to survive. When we do things that truly matter to us, it's tempting to hold back and play it safe. Don't!

I learned this playing baseball for over 18 years at the college and professional levels. Some of the most disappointing moments I had weren't when I failed, but when I held back—due to my fear of failing. Encourage your employees to let go of their obsession with survival and instead take risks. Go for what they—and the company—want and need to succeed. As one of my coaches pointed out, "You're living your life as though you're trying to survive it. You have to remember: no one ever has!"

Whether you run a business, manage a team, or simply want people around you to feel safe and empowered to bring all of who they are to their work, there are two components to creating an atmosphere of authenticity that leads to greater levels of engagement, performance, and success:

Healthy, high expectations. High expectations are essential for people to thrive. We almost always get what we expect from others, but if we demand perfection many may fall short. Employees will feel they're not set up to succeed. Healthy, high expectations challenge people to do their best without pushing them for insatiable, unhealthy perfection.

High level of nurturance. People want to feel they're seen, heard, and valued—not just for what they do but for who they are. A high level of nurturance creates a safe space for employees to make mistakes, ask for help, speak up, and disagree. Nurturing environments are filled with compassion and empathy. People feel supported.

We often think that in order to have a high bar we can't be nurturing. Or we think that if we nurture people, we can't expect a lot from them. The goal is to do both, and to do so passionately.

"We erroneously think being vulnerable is a sign of weakness. It's not."

Asking our employees to bring their whole selves to work, and creating an environment that allows them to do so, is no small feat. It takes courage on everyone's part and can, at times, go against conventional wisdom. However, technology companies must do all they can to attract, develop, and engage the best people in today's competitive global economy.

Creating an environment where employees feel safe and encouraged to flourish will help your company attract individuals committed to your organization's success.

About the Author Mike Robbins is the author of the forthcoming book *Bring Your Whole Self to Work* (May 2018). He also wrote three previous titles: *Focus on the Good Stuff*; *Nothing Changes Until You Do* and *Be Yourself*; *Everyone Else Is Already Taken*. He's an advisor to Nutanix and an expert in teamwork, leadership, and culture. He delivers keynotes and seminars, and consults with top technology companies across the globe. www.Mike-Robbins.com

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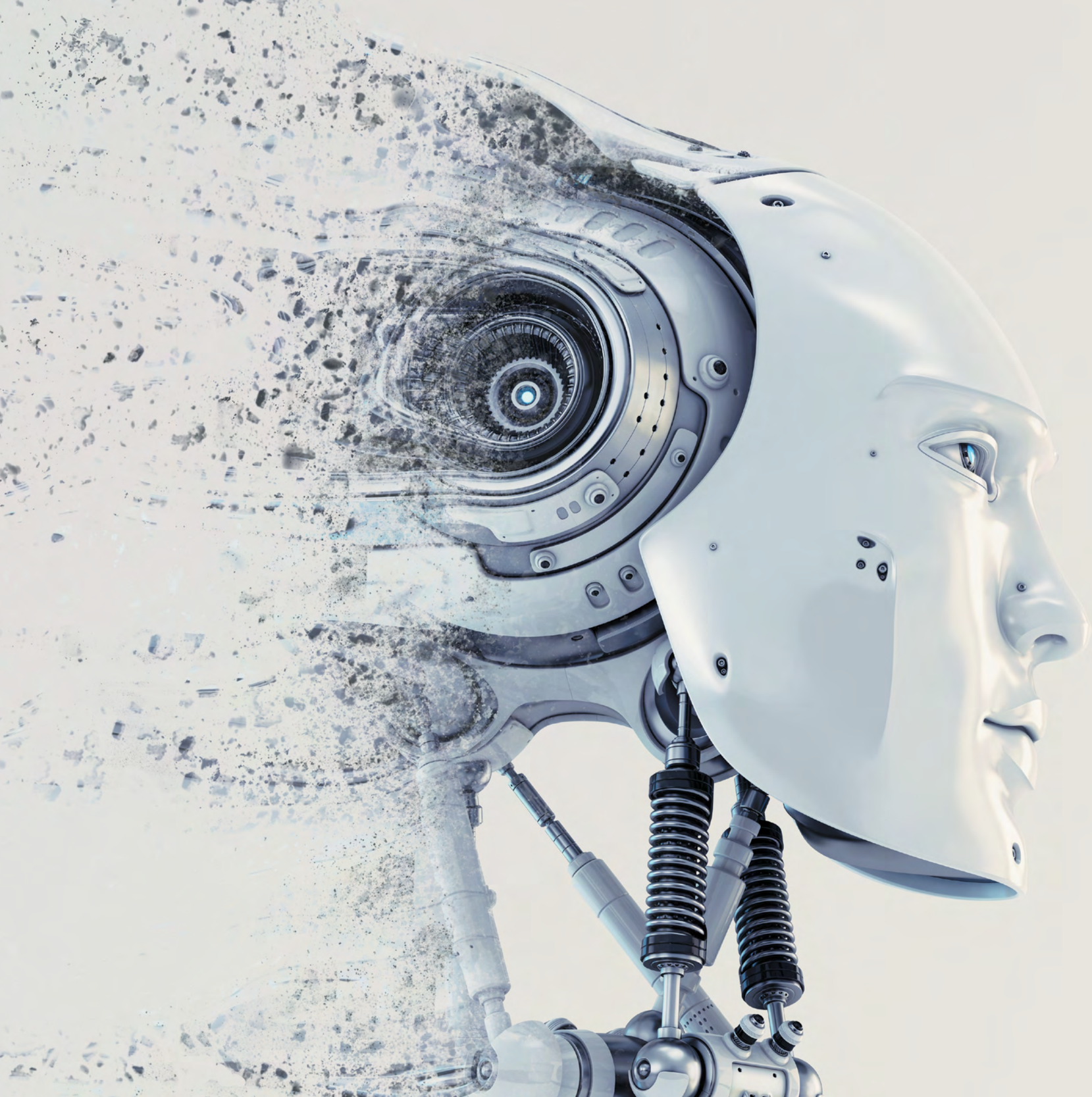


ROBOTS ARE TAKING OVER THE WORLD. BUT NOT THE WAY YOU THINK.

MACHINE LEARNING IS RED-HOT. LET'S CLEAR AWAY THE HYPE AND MISCONCEPTIONS TO SEE HOW THIS NEW INCARNATION OF AI CAN BENEFIT YOU TODAY - *BY SAMEER SINGH, RAHUL SINGH, AND SATYAM VAGHANI*

Much like jetpacks, robot housekeepers, and flying cars, artificial intelligence (AI) has been a long-promised miracle of science that remained tantalizingly out of reach for decades. On the bright side, we have yet to be enslaved by our robot overlords.

The truth is, the AI invasion has already begun—but without all those pesky Terminators or the self-aware (and decidedly evil) Master Control Program from Tron. In fact, AI pervades your everyday life without you even knowing it—thanks to a subcategory called machine learning or ML. ML enables computers to learn without having to be programmed for every task, simply by being exposed to vast amounts of new data.

ML systems are learning all the time, hidden inside the devices and equipment all around you. ML automatically tags friends and family members in your Facebook photos. It gives you personalized movie and book recommendations on Amazon and Netflix. It filters spam out of your email inbox. It gives you directions or helps you with small tasks via Siri or Alexa. And the exciting thing is, people are finding new uses for it all the time.

WHY YOU SHOULD CARE ABOUT MACHINE LEARNING

Regardless of what industry you're in, you should pay attention to machine learning because of the strategic business advantage it can give you. By offloading rote tasks to machines, you free up your human workforce for creative thinking about better ways to overcome challenges and grow your business.

Even now, machine learning is transforming business processes and shattering paradigms. It's best used to recognize patterns, which allows the system to then extract insight, discover anomalies, and make predictions. It empowers enterprises to gain insight and competitive advantage through data.

Forget about the self-driving car and robot butlers for a minute—machine learning is redefining the way business gets done. It's keeping businesses competitive and profitable by detecting financial fraud; enhancing security with facial recognition; detecting manufacturing defects; personalizing the customer retail experience based on past buying behaviors; predicting molecule bioactivity for drug discovery; improving translation software with natural language processing.

Machine learning also plays a big part in Web searching, credit scoring, stock trading, predicting vehicle maintenance needs, monitoring patients in ICUs, meter reading and billing, and so much more. It excels at tedious tasks and analysis, leaving people free to spend more time on higher value projects. A machine can't realistically work as a doctor or lawyer (yet) but it can allow human doctors and lawyers to serve more people, more effectively, by taking over a lot of their everyday research and rote data analysis.

A 20TH CENTURY IDEA, REVITALIZED FOR TODAY

Though you might have started hearing about machine learning only recently, it is not a new concept. The term was coined back in 1959 by IBM AI pioneer Arthur Samuel, but the field wasn't popularized until the 1990s. However, computing power was expensive and limited then, and progress was slow.

Fast forward to today and many experts consider this era the second coming of machine learning. The renewed interest and rapid advancements are due to the convergence of several critical factors: the massive amount and varying types of available data from millions of online users as well as sensors and smart devices; more affordable data storage; and cheaper, more powerful computer processing, especially with graphics processing units (GPUs). These factors make it possible (and much easier) to produce models that can crunch bigger, more complicated data and get quicker, more accurate results. Now it only takes 1 hour to train a neural network. Just 5 years ago, it would take a full week. Clearly, this creates all kinds of possibilities today that past computer scientists couldn't have dreamed of.

The final tipping point for the machine learning craze has been the appearance of open-source machine learning frameworks, many backed by large companies, such as TensorFlow from Google, PyTorch by Facebook, Apache MXNet (adopted by Amazon Machine Learning), Microsoft Azure ML Studio, Keras, Sci-kit Learn, and others. Before these products were available, implementing machine learning required deeper understanding of the algorithms—plus lots of R&D money and heavy-duty computing platforms normally used only in academic or scientific environments.

These commercial frameworks have brought machine learning to the masses. You don't need to understand all the science behind it to experiment with the latest ML technology. There's even public code and a wealth of tutorials for creating your own ML applications for things like language translation and automatic photo captioning. The democratization of machine learning is creating a "virtuous cycle"of technology: everyday users discover new ML use cases and create increased demand for easy-to-use systems, which in turn drives experts to further study and development.

MACHINE LEARNING 101: HOW IT WORKS

ML is one giant leap beyond computer programming in the past, where people had to write code to tell the machine exactly what to do—which meant the coders had to know how to explain every step in detail to get a specific result. With ML algorithms, it's possible to program machines to learn things that are almost impossible to code step by step, such as facial recognition.

It's already been several years since Google built an unsupervised, self-learning neural network, known as Google Brain, that taught itself to identify cats in YouTube videos after being exposed to 10 million unclassified, untagged images. The exciting thing about this (besides the fact that even computers watch cat videos!) is that no one told the Brain, "this is a cat." It simply developed its own concept of a cat. This was one of the first modern breakthroughs in deep learning using neural networks. It's neural networks that get the most ML press these days because they're used in the most high-profile projects, including image recognition, voice/sound recognition, and microscopic flaw detection.

BEWARE THE LIMITATIONS

Machine learning can do a lot of great things, but it's not a magic bullet. Because you don't explicitly program ML systems, it can be difficult to know how a system obtained its results. This "black box" nature can cause problems in regulated industries, and can also make people hesitant to blindly follow the system's recommendations.

Also, the saying "garbage in, garbage out" still applies here. Your output—results, predictions, insight—will be meaningless if the data you input is meaningless. Having reams and reams of data doesn't equate to having the right data. The quality of your data is essential to getting accurate results from your models. It's the same as training a human coworker—give them inaccurate information and the wrong tools, and they'll most likely do a bad job. It's also important to be aware of possible human bias leaking into your algorithms. This happens, for instance, when an ML system identifies all images of soccer players as men and all people in kitchens as women, because that happened to be the most common case in the data set they used to learn.

Organizational challenges also make ML adoption difficult in enterprises. Because the resurgence of ML is fairly recent, there is a serious shortage of skilled people to head up and execute these projects. It can be an uphill climb to promote a data-driven approach and a culture of data-driven decision making.

SO ... WILL AI END UP TAKING MY JOB?

The interesting answer to this question is yes and no. Science fiction has given eternal optimists and doom-and-gloomers alike extremely unrealistic expectations about intelligent machines. So on one hand, yes, machine learning has advanced very quickly in recent years and there are systems that have the capabilities to take over many tasks in your business over the next few years. But at the same time, no, their powers are very strictly defined—a machine that can translate the Chinese writing on your menu into English most likely can't understand Chinese speech or recommend a good Chinese restaurant. They're very good at very specific tasks. Today, at least, they excel at repetitive work but aren't good at solving creative problems.

Here's the question we should be asking: how can I use those narrow capabilities for the good of my business today? We've only just scratched the surface of what machine learning can do. While the field has a long way to go to mimic true human interaction, machine learning capabilities are advancing every day. Even with its limitations, there are likely thousands of business applications for machine learning that no one has explored or even discovered. Now that's exciting.

Dr. Sameer Singh is an Assistant Professor of Computer Science at the University of California, Irvine. His focus is working on large-scale and interpretable machine learning applied to information extraction and natural language processing.

Rahul Singh is a senior member of the technical team at Nutanix, a former research staff member for the IBM T.J. Watson Research Center, and a machine learning expert.

Satyam Vaghani is VP, Technology at Nutanix, where he leads the technology roadmap for current products and advanced development. He previously served as co-founder and CTO of PernixData.

CLOUD SERVICE BROKER: THE NEW ROLE OF IT

A Q&A WITH DROPBOX VP OF INFRASTRUCTURE AKHIL GUPTA

When it comes to cloud, Dropbox helped write the book. With the recent building of Dropbox's own unique storage infrastructure, we decided to catch up with VP of Infrastructure Akhil Gupta for "out of the box" insights on how the cloud space is evolving.

Q : Let's start with the big topic: digital transformation. We're all hearing this term a hundred times a day. But how exactly are IT decisions changing to support digital transformation and service agility?

A : Fundamentally, the role of IT leaders hasn't changed. They're still responsible for enabling their teams' productivity by providing them with access to the best technology. Practically, the consumerization of IT has given these leaders a wider range of options for achieving that goal. In that sense, IT's decisions are changing to fit their new role as a cloud service broker.

In the past, IT had to procure technology systems and then securely provision them to their workforce. Today, employees can bring their favorite applications to work with them. As a result, employees don't need to spend time learning new technology systems, and they don't need to modify their work habits around clunky legacy IT systems.

IT leaders are now responsible for figuring out which applications are driving the most value for their users, and finding ways to deploy those applications broadly across the organization.

Q : Migrating to cloud is high on every CIO's priority list. Why? Is it only a cost and scale issue? How do cloud services support digital transformation initiatives?

A : If you are only looking at migrating to the cloud for cost savings, you are missing a huge opportunity to do more. Cloud computing offers a number of benefits to users over traditional on-premises deployment models, including:

- **More options for deployment models**: CIOs who need more control over certain types of data, but who still want to take advantage of the benefits of cloud, can chose a hybrid-cloud deployment model, where some of their company's data is stored in a private cloud, while other data is stored in a public cloud.
- **Better utilization of resources:** A hybrid cloud strategy allows companies to scale up or scale down depending on demand. This means that CIOs only need to spend money on the IT resources that their teams are consuming—rather than purchasing hardware and software based on an estimate of future use.
- **Always up to date:** Public cloud vendors push updates constantly, versus hardware vendors that require complicated and expensive rip-and-replace updates.
- **Better user access to data:** Cloud computing removes the physical restraints that prevent users from accessing their data. With tools like Dropbox Paper, users can collaborate on documents in real time, regardless of geography, which allows teams to improve productivity.
- **Better security**: At Dropbox, for example, our security teams are always watching out for new threats to our users. We have dedicated security teams that work to protect our services and monitor for compromise, abuse, and suspicious activity. We've implemented a broad set of controls, including independent security audits and certifications, threat intelligence, and bug bounties for ethical hackers. In addition, we build open source tools such as zxcvbn, use bcrypt password hashing, and offer universal two-factor authentication to all users. This level of security just isn't present with most on-premises deployments.

Q : Settle the debate for us, if you can. Private cloud? Public cloud? Or hybrid cloud? Does each have its own best use cases? How do you choose the right cloud strategy (or mix) to accelerate digital transformation?

A : There isn't a one-size-fits-all approach to deploying cloud computing. Users with workloads that are subjected to more regulations will inevitably gravitate toward private cloud models—where their data is stored in a single-tenant environment on servers in third-party data centers—as a way to limit risk. For users looking to take advantage of the scalability, cost, and productivity benefits that cloud offers, public cloud services are probably the best solution. We built our cloud because we reached a scale where it made sense for us to do so. For our users, it allows them to automatically scale up on demand, and it also enables us to innovate in infrastructure for the benefit of our users.

Q : Dropbox serves millions of customers worldwide. How does it build infrastructure to support this scale?

A : When we launched in 2008, we were based on third-party cloud infrastructure, but we launched our own custom-built storage infrastructure in 2015 with a system that we called Magic Pocket, and have stored more than 90 percent of our user data on it since then.

There were a couple reasons behind this decision. First, one of our key product differentiators is performance. Bringing storage in-house allows us to customize the entire stack, end to end, and improve performance for our particular use case. Second, as one of the world's leading providers of cloud services, our use case for block storage is unique. We can leverage our scale and particular use case to customize both the hardware and the software, resulting in better unit economics.

With about 75 percent of our users located outside of the United States, moving onto our own custom-built data center was just the first step. We also continue to offer data storage for users in Europe via our relationship with AWS, and have built a global private network to allow us to reliably carry our user traffic to our data centers. In fact, in June we announced that we were launching five new facilities around the world, bringing our total to 25 facilities across four continents.

Q : As businesses seek out better ways to bring services to market quickly, you must have a wealth of information you can share. What are some key learnings?

A : We have a few values that guide our business and underpin everything we do at Dropbox. Those include:

- **Be worthy of trust:** This means being authentic, saying what you'll do and doing what you say, while also taking care of each other and our users, and keeping their best interests at heart.
- **Sweat the details**: This means deeply understanding and getting to the heart of problems while also obsessing over quality, and striving to master our craft.
- **Aim higher:** This includes setting audacious goals and having an irreverence for what's possible, while also thinking big and being open to disrupting ourselves.
- **Embracing "we" not "I":** We place a ton of value in people really knowing each other, and newer folks are often awestruck by how warm and humble Dropboxers are. More than that, this is about people routinely placing the welfare of the company first.
- **And the happy cupcake**, which is about adding an authentic, human touch to everything we do. But more than that, it's about finding creative ways to make our users (and each other) smile.

Q : SaaS, IaaS, PaaS…it seems that everything IT does is moving to the cloud. How do you see the role of IT evolving over the next decade? And how should IT leaders prepare today?

A : The role of IT is shifting into a role of cloud service broker. IT managers and decision makers don't need to procure and provision legacy technology anymore; instead their role is shifting into one that is about enabling their workers to use the tools that they want.

IT leaders need to find ways to balance the needs of the business with the desires of their workforce. At Dropbox, we've grown to 500 million registered users, many of whom use our tools in both a personal and professional capacity. To help IT say yes to their workers, we've rolled out a number of administrative capabilities that give leaders visibility into and control over their teams' Dropbox usage. In doing so, we're trying to make it easier for IT decision makers to say yes to their employees while balancing the security and regulatory needs of the business.

"If you are only looking at migrating to the cloud for cost savings, you are missing a huge opportunity to do more."

THE TACTICAL DATA CENTER

EXTREME PORTABILITY FOR EXTREME ENVIRONMENTS

What do you get when you put the power of hyperconverged compute, storage, virtualization, and networking infrastructure into a lightweight, ruggedized case the size of an airline carry-on? The world's first and only enterprise-grade tactical data center—and a game-changer for military, first responders, and mission-critical operations in the field. Its remarkably compact design and portability lowers total cost of ownership and is reducing overall logistics footprints up to 50 percent.

NEXT Magazine caught up with Chris Barnes, Director of Systems Engineering at Klas Telecom Government, the Herndon, Virginia-based company and Nutanix partner behind developing the Voyager Tactical Data Center (Voyager TDC) system.

IN SIX WORDS OR LESS, HOW WOULD YOU DESCRIBE THE VOYAGER TDC?

I can do it in five:"Extreme portability for extreme environments." Call marketing, I think I just made up a new slogan. Actually, what we like to say is "take your data with you." That's the key benefit of the Voyager TDC, and a popular trend in tactical communications that we're addressing.

IS IT THE COMPACT SIZE THAT MAKES THE VOYAGER TACTICAL DATA CENTER A GAME-CHANGER?

It's really size, weight, and power consumption. SWaP is the term we use in the military. Over the last five or six years, the federal government has been trying to reduce SWaP so warfighters can carry less equipment, be more efficient, and spend less time on logistics, transportation, and setup and focus more on the mission at hand. Recent advancements in technology have enabled Klas Telecom to engineer incredible capability in increasingly smaller form factors. It's common for the military and first responders or emergency personnel to lug 4RU or 8RU traditional enterprise servers and switches inside multiple large transit cases to deploy all over the world, often in the harshest environments. Hundreds of pounds of equipment, multiple uninterrupted power supplies, or UPSs, batteries, and cables need to be transported. Not to mention all the transport vehicles, fuel, generators, tents, and personnel.

The Voyager TDC puts the storage, compute, and communications resources needed in the field into a ruggedized, 63-pound rollaway case that fits in an airplane carry-on compartment. One person can move it easily anywhere in the world.

THAT COVERS SIZE AND WEIGHT. TELL US MORE ABOUT POWER.
When you get deployed to a greenfield environment, a place with zero infrastructure, your first and foremost challenge will be power. The second challenge is being disconnected from any kind of cloud or transport infrastructure. In other situations, such as natural disasters, you may have limited or intermittent bandwidth. We call that a DIL [disconnected, intermittent, limited]. You may have a flaky connection where you sit on the edge of a satellite footprint and can pull only 512 kilobits or maybe 1 megabit of data over that stream. Or, something can disrupt wired or wireless transmissions, such as a hurricane.

But the Voyager TDC running on battery power will provide voice, video, and data services wherever you are until hardware and other infrastructure resources arrive on the scene. The TDC can run up to two hours just on batteries alone, and you can even plug it into a single-phase wall power outlet.

Once the transport link is back up, it will start replicating and re-federating changes to the data, something that isn't as feasible when you're saddled with big transit cases and power that requires a heavy generator or huge bank of batteries to fire up.

THAT'S IMPRESSIVE. THIS REDUCTION IN SWAP MUST YIELD SOME REAL COST BENEFITS TOO.
Absolutely. Because it simplifies logistics, transportation, and operations, it lowers your total cost of ownership. There's a lot that goes into traditional deployments. Not only all the equipment I mentioned, but what we call life support—all the tents, generators, tables, chairs, cable, heating, and air conditioning. We can reduce overall logistics footprint by at least 25 percent and up to 50 percent in some scenarios. For one exercise, the reduction in mission transportation was reported to be calculated at one metric ton. In a separate event, it was reported that the cost saving would be over $1 million.

Another benefit is no longer needing to rely on bandwidth-constrained SATCOM links back to the data center to process large amounts of data. With the Voyager TDC, users can store, analyze, disseminate, and replicate data locally for faster intelligence and decision making in the field.

CAN YOU SHARE A SPECIFIC EXAMPLE OF HOW THE VOYAGER TDC IS BEING DEPLOYED THE FIELD?
I know of several use cases, but because they involve sensitive information, I need to share in generalities. One of the most successful was a joint exercise that took place in the U.S. and Eastern Europe. We had a Voyager TDC sitting at a U.S. military location, federating and replicating regular data like email, chat, database, portal. and invoice services. When they received their mission orders, a three-person team was able to take the Voyager TDC, power it down, put the lids on the rollaway case, and head straight for a commercial airport—instead of a military C130.

Due to the sensitive nature of the data, the personnel removed the hard drives [SSDs] and configuration data from the hardware, using something called the Voyager Ignition Key, or VIK, to gate check the system and maintain positive control over the important data. This alleviated any concerns for lost baggage or confiscation of information by foreign officials.

Once on the ground, the team rented a car to drive out to the exercise location. Three guys and a data center in a tiny European car. Not bad. Two hours later, they had voice, video, data—and all the services they had running back at base—up and operational locally. And that was without any prearranged power available at the exercise location. Nobody identified power requirements, table space, anything. They could set it up on the floor, turn it on, and start delivering services immediately.

DOES THE TDC REQUIRE SPECIAL LEVELS OF SECURITY?
The Voyager TDC is treated no differently than a laptop or any other device that connects into a government or enterprise network. It must meet all the same security guidelines and networking protocol stack information, so all of that is handled during initial setup, when you have all these smart engineers, systems admins, and information assurance people around. When you're ready to go deploy in the field, it's just a matter of powering it on. Once the link comes back up, you can even reestablish remote management if you wanted to.

I UNDERSTAND YOU WERE IN TAMPA, FLORIDA WHEN HURRICANE IRMA SWEPT THROUGH.
That's correct. In fact, I was there to witness the guys in one of the units where I used to work loading all the virtual machines in their pre-production lab onto a Voyager TDC. When they were ordered to evacuate, they continued to operate, even in the vehicle they were evacuating in. Fortunately, they never lost their primary or backup data, and were able to access their current data, organizational structure, communications, and applications where they were redeployed.

HOW ELSE DO YOU SEE THE TDC BEING USED IN EMERGENCY SITUATIONS?
After the military, natural disasters have been the next major application for the Voyager TDC to date. If a hurricane, earthquake, or other disaster takes out cellular and other communications infrastructure in a given area, we want to provide local, state, and federal authorities with the ability to get onto the TDC autonomous network and provide gateway access and connectivity to the public Internet. This would enable government, first responders, and law enforcement to communicate and share vital information practically from the moment they hit the ground.

PORTABLE DATA CENTER TO THE EXTREME
The Voyager TDC is an enterprise-grade compute and data storage network that is built to military ruggedization standards. A standards-based, commercial off-the-shelf (SCOTS) system, powered by the Nutanix Enterprise Cloud Platform, the Voyager TDC includes a tactical 10 Gigabit Ethernet switch, 512 GB RAM, 32 physical cores, built-in UPS, AC/DC power, BB-2590 hot-swappable batteries, and fits in an airline carry-on-sized rollaway case.

THE INFRASTRUCTURE THAT POWERS TACTICAL DATA CENTERS

By Binny Gill, Chief Architect, Nutanix

So much of what makes a tactical solution like the Voyager TDC successful aligns with Nutanix's engineering design philosophy. I break it down into the following five capabilities.

1. THE ABILITY TO RUN ON ANY FORM FACTOR, AT ANY SCALE
What we've built with the Nutanix Enterprise Cloud platform is an operating system that can run on anything—on-premises platforms from Supermicro ®, IBM®, Dell EMC, Lenovo®, Cisco®, and HPE®; in the cloud via AWS™, Google Cloud Platform™, and Azure™; or natively with Nutanix Xi™ Cloud services – even on the Intel NUC on a drone. For any successful operating system to become ubiquitous, this kind of flexibility is essential. Just like Linux pervades embedded devices to large supercomputers, this new cloud operating system enables tactical data centers in the field, branch offices, and enterprise data centers of all shapes and sizes.

2. ONE-CLICK USER EXPERIENCE
The soldier who unpacks a tactical data center on the battlefield or Red Cross worker inside a tent who needs access to a database aren't IT experts. A system such as the TDC must be extremely intuitive and automated. We call this one-click operation. Building a simple product requires a lot of engineering. In fact, one of the largest engineering teams at Nutanix is the User Interface/User Experience (UI/UX) team. The whole idea is to build a system that doesn't require a field manual or lengthy operator training. The significance of an intuitive system is only amplified in stressful environments where TDCs are operated.

3. AN INTELLIGENT, SELF-HEALING SYSTEM
An intelligent, self-healing system is critical in the field when you can't reach out for help, call tech support, disclose your location, share your screen with unclassified personnel, or spend 10 or more minutes troubleshooting an error message. The system needs to be smart enough to either heal itself or clearly tell the user what needs to be done to remedy the problem. At Nutanix, we design the system to handle and recover from any kind of software or hardware failure, both permanent and transient. This "build for failure" philosophy coupled with the "fail in place" design principle is extremely important for any cloud operation system. Whether in a large cloud data center or in a tactical deployment like the Voyager TDC, when a component fails, it's not practical to assume that someone will rush to fix it. The system must make use of available resources to self-heal and regain redundancy to be ready for even more failures down the line—without any human intervention.

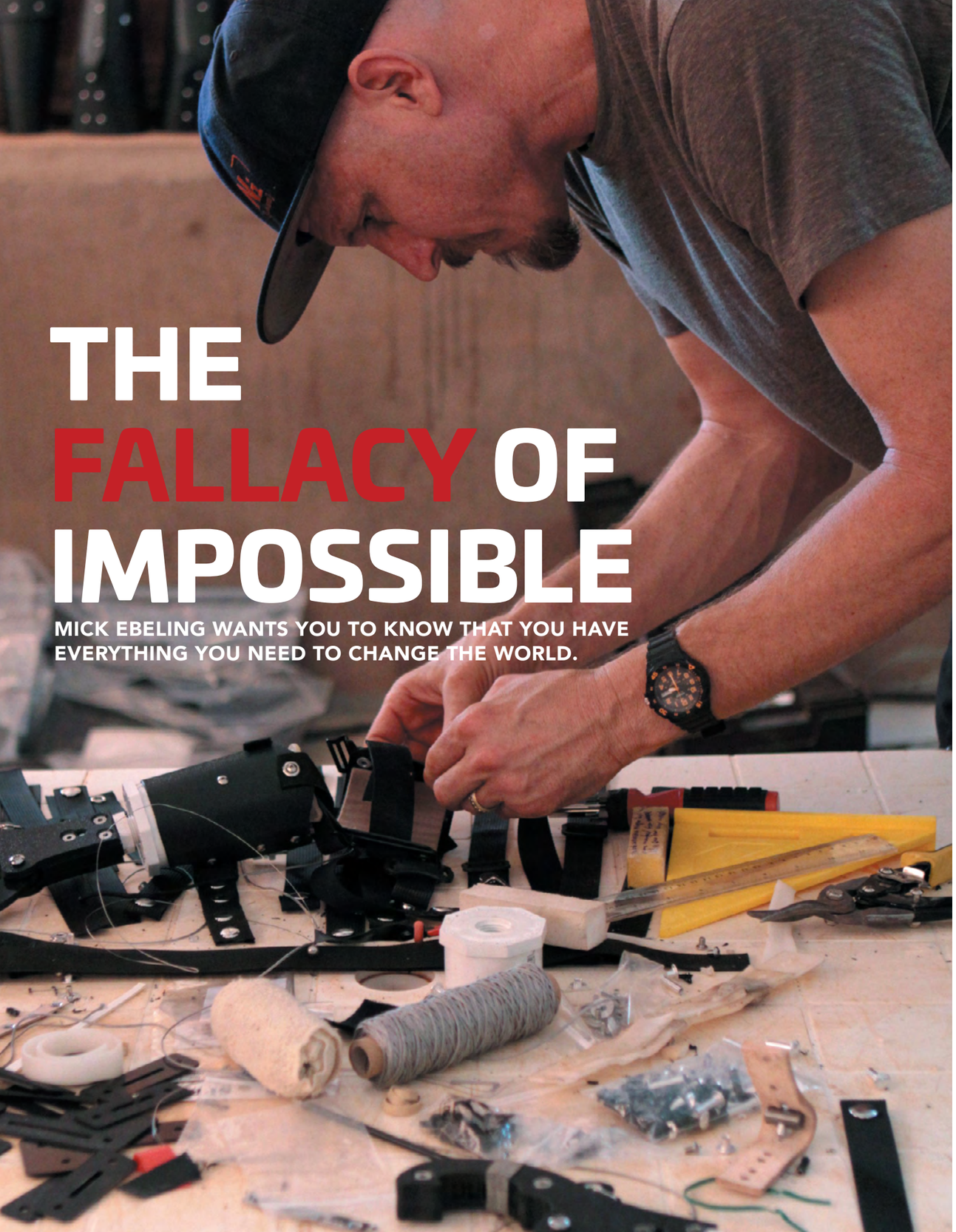
4. DEFENSE-IN-DEPTH SECURITY
In tactical deployments or multi-tenant cloud environments, the importance of building in strong security cannot be overstated. You have to think about security at all layers of the software and hardware, and not just at the user interface. The defense-in-depth model builds security like a castle. Even if an attacker compromises one layer of the perimeter, additional walls are standing to keep the data secure. Another important consideration is to reduce the potential attack surface by simplifying the overall software stack, which can be done by eliminating optional software components in a purpose-built appliance.

5. DISTRIBUTED YET UNIFIED
Today, computing extends all the way from a company's central headquarters to remote offices to the intelligent, tactical edge. Managing all deployments individually isn't efficient or secure. The solution lies in central management of all locations in a way that's resilient to intermittent or low-bandwidth connectivity. The combination of sufficient visibility at the core with sufficient autonomy at the edge is key in this new world of dispersed clouds.

“CUSTOMERS BECOME ADVOCATES WHEN THEY BUY INTO YOUR VISION AND PRODUCT ROADMAP. THEY BECOME ZEALOTS AND BRAND CHAMPIONS WHEN THEY CAN’T WAIT FOR YOUR NEXT NEW PRODUCT OR UPDATE.”

John McAdam

LIFESTYLES



THE FALLACY OF IMPOSSIBLE

MICK EBELING WANTS YOU TO KNOW THAT YOU HAVE EVERYTHING YOU NEED TO CHANGE THE WORLD.

Children who have lost their arms should be given new ones. People who have lost their voices should be able to speak. And artists immobilized by a devastating disease should be free to express themselves.

That's what Mick Ebeling thinks. He's the chief innovation instigator and founder of Not Impossible Labs, an award-winning content and technology solution creator based in Los Angeles. The Not Impossible team improves the lives of individuals in need by developing low-cost, tech-based solutions, and then shares their powerful stories to teach and inspire others to do the same. "We call it technology for the sake of humanity," says Ebeling. Their motto is "help one, help many."

Making the impossible possible is what Ebeling and his growing band of volunteer hackers, designers, and dreamers have been doing since 2008, when they committed themselves to helping world-renowned graffiti artist Tony "Tempt1" Quan to draw again after ALS, a neuromuscular disease, had left him completely paralyzed. Their invention, the EyeWriter, has enabled Tempt1 to make art by controlling a laser with his eyes. The EyeWriter won several awards, including being named one of Time magazine's "top 50 inventions of 2010." Rather than profit from the device, Ebeling's team published DIY instructions for free on the Internet so anyone could build their own EyeWriter for about $100 in parts.

"Anyone can be an innovator," says Ebeling. "Whether it's to improve your business, your career, or the lives of millions, you have everything you need right this minute to make a lasting, impactful difference."

All you need to do is find the absurd situation that needs fixing, and follow the philosophy that continues to serve the good people at Not Impossible and the thousands of innovators who have joined their revolution.

FIND THE ABSURDITY AND REVOLT AGAINST IT

Before you can innovate, you first must identify what needs changing. Ebeling recommends looking for the absurdities around you. "An artist that can't move? That has no canvas on which to express himself? That's absurd," says Ebeling. "A boy in war-torn Sudan gets his arms blown off and wishes he were dead so he won't be a burden to his family? That's not right. These things shouldn't be."
This can apply to your work, too. Look for the absurd around you. Is that biweekly meeting with 17 director-level people really moving the needle? Whatever it is, you'll know it, because you'll feel the passion burn in your belly. "If you can't stop thinking about it, then you have the passion to do something about it," says Ebeling. "Don't ignore that feeling. Act."

COMMIT, THEN FIGURE IT OUT

People often wait for permission to act. They may feel that they're not qualified, that they don't have the necessary title, credentials, or training to step up. When Ebeling committed to helping Tempt1 to draw again, he was a television and video producer. "I knew nothing about ocular recognition technology. My plan was to write a check," recalls Ebeling of the fundraiser where he first met the artist and his family. Instead, he found himself signing a promise to help Tempt1 communicate and make art again. "At the time, I had no idea how I was going to fulfill that promise."

Ebeling is quick to remind people that if his ragtag group can do what it does, anyone can. "That's the whole point of the impossible movement," says Ebeling. "You don't need to wait for government or your boss to make a difference. It doesn't matter how many letters you have behind your name."

RADICAL COLLABORATION

To succeed, you need to operate from a place that Ebeling describes as "egoless innovation" and surround yourself with people who are smarter than you. "You have to be OK with asking for help or being the dumbest guy in the room. After all, this isn't about you. It's about the cause," says Ebeling. "People naturally want to align around projects where there is great purpose."

There's no big secret to rallying people to your cause. It's about passion. "Passion is contagious," says Ebeling. "Especially when you are out to right a wrong. When you operate from the heart, others of like mind can sense it. It's visceral, and there's no stronger power than when all these like minds and hearts come together to solve problems worth solving."

IT'S OK TO BE CLUELESS; IN FACT, IT'S MANDATORY

According to Ebeling, a little ignorance and a lot of naïveté are mandatory. "When we started, we had no idea how hard this was going to be," says Ebeling. "If we knew what we were up against, we may never have started." That's why purpose, passion, and committed action are so critical to success.

Every new project provides another opportunity to show you just how much you don't know. In Don's Voice, the film Ebeling produced about an ALS patient who hadn't been able to speak in 15 years, Ebeling's team figured they had this one. "Tempt also suffered from ALS, so we were confident we had the answer. We brought all this cool software and sophisticated equipment, and it was totally useless." Don lost his ability to move in 1999, before the Internet brought technology to the masses. "He had never even touched a computer before."

MORSELS OF PERMISSION

You don't need the answers to start your search for a solution. "You keep your ears open for things that may be tangential to your problem," says Ebeling, "and you put all these bits and pieces in a pile that I call morsels of permission."

When he committed to helping Daniel, the Sudanese boy who had lost his arms when his village was bombed, Ebeling had no idea how to make a prosthetic arm. "I remembered reading about this guy that made a prosthetic finger with a 3-D printer, so I looked him up," recalls Ebeling.

Innovation rarely bursts from thin air. New solutions are more often found in a mashup of discovery, by combining and adapting existing technologies to do something they were not originally intended to do. Ebeling recalls how shortly after hearing about Tempt1's story, he met a group called Graffiti Research Lab (GRL). They were using laser light to draw on the sides of buildings. "My wife and I were eating dinner, and it occurred to us, if there's technology that exists where you can use your eyes to control things, why not combine that with the tech from GRL, so Tempt could draw by controlling lasers with his eyes?"

DON'T SEE FAILURE AND IGNORE THE "NOS"

You can't focus on constraints or listen to the skeptical voices, especially the ones inside your own head. "You have to learn to ignore all the 'nos,' because there will be a lot of them," says Ebeling. "Setbacks will happen, but you have to look at each failure as a ramp, not a roadblock." Ebeling's team has an "always in beta" philosophy that keeps them iterating despite the inevitable soul-crushing defeats. While developing their prosthetic arm for Daniel, they printed a prototype for a friend who was missing her right arm. They had printed a left one.

"It's a funny thing, because you're on this crazy timeline. But the faster you acknowledge what isn't working, the faster you will find what will." In this case, since quitting wasn't an option, Ebeling found himself on a plane to Sudan to build an arm for Daniel, and to teach the people there how to do something he himself had yet to do successfully. "Everything that could go wrong did, and every day, Daniel showed up with a smile." Four days later, it was Ebeling who was smiling, when Daniel fed himself for the first time in two years. In the time it took the exhausted but elated Ebeling to fly home, the team in Sudan that he had trained and equipped had printed two more prosthetic arms for villagers in need.

IF NOT ME, WHO? IF NOT NOW, WHEN?

Mick Ebeling doesn't think there's anything unique or special that enables him to do the things he does. That's why he's convinced that you—yes, you, reading these words—have the same ability to solve problems and change lives. You just have to do what he did one day: wake up, look at the absurdity around you, and think, "If not me, who? If not now, when?"

HELP ONE, HELP MANY: Daniel with his $100 prosthetic arm (traditional prosthetic arms can cost up to $15,000). The equipment Ebeling left behind became the world's first 3D printed prosthetic laboratory.

TECHNOLOGY FOR THE SAKE OF HUMANITY

Not Impossible Labs continues to engineer, hack, and crowd-solve issues of inability and inaccessibility to help the most vulnerable on our planet. They share their stories to incite more people to act, innovate and solve previously insurmountable issues of health, happiness, and humanity.

To learn how you can get involved, visit WWW.NOTIMPOSSIBLE.COM

WHEN YOU VIEW YOUR EXISTING PROCESSES THROUGH THE LENS OF YOUR CONSTRAINTS AND THE IDEALS OF YOUR PRODUCT ROADMAP AND CULTURAL PILLAR, ASK YOURSELF: DO OUR PROCESSES STILL MAKE SENSE? IF THEY DON'T, MOVE ON. IF THEY DO, IT'S TIME TO EXPERIMENT.

Bob Dussault

BY FABIEN COUSTEAU

NAVIGATING SEA CHANGE

THREE PRINCIPLES TO CONSIDER ON YOUR DIGITAL TRANSFORMATION JOURNEY

I'm an adventurer by nature. I'm sure it's hereditary, passed down from my father and his father before him, both of whom dedicated their lives to oceanic exploring. And like them, I've let this passionate spirit of adventure take me all over the world to observe the "life aquatic" and share my experiences with others. Along the way, I've had the good fortune to use some of the latest technology—disruptive technology, if you will—to see and record things never before captured by man.

It's truly breathtaking to watch a Christmas tree worm fan out its colorful gills. Or a mantis shrimp spring with amazing force to catch its prey. Or a great white shark glide peacefully beside you. That's what technology can do. Empower you to go further, deeper, and longer than ever before. And yet, in using innovative technology to study species, sometimes thousands of feet below sea level, you're reminded that there is a balance between progress and preservation.

The digital transformation that's underway across all industries is forever changing how people work, govern, communicate, and play. Companies are rapidly adopting new technologies and processes to compete in the global market. But it's the leaders who think thoughtfully and responsibly who will thrive in the long run. I liken this approach to following the three rules of nature: **adaptation, evolution, and diversification.**

Adaptation: Swimming with the Sharks

It has always bothered me how people vilify sharks. It started with *Jaws* in the mid-70s, and ever since there's been a great, if misguided, fascination with sharks—mostly driven by fear of these wonderful creatures. The result has been a ruthless and unprovoked slaughtering of sharks in waters all over the world.

If only we could better understand how sharks live in their natural habitat, perhaps we wouldn't be so quick to condemn them. The trick is to get close enough without being noticed. Divers in cages chumming the water may provide dramatic video footage but offer little insight into how these great beasts behave when we're not around.

When I was a kid, I loved the comic book *The Adventures of Tintin*. Big surprise, right? In one issue, Tintin traveled the deep blue in a shark-shaped submarine. How innovative was that? What if we could create something similar that could essentially assimilate into the shark habitat, allowing us to calmly observe without raising suspicion? Thus, the idea of our own great white shark-shaped submarine was born.

We built a 4-meter-long "Trojan shark" and then wrapped it in a flexible, stretchy material called Skinflex—the same synthetic used in Hollywood for animatronics, as well as in prosthetic limbs. Then we used a proprietary closed-circuit pneumatic propulsion system to drive a set of pistons and cable so the submarine could move just like a shark.

After two years of testing and refining our submarine, and four and a half months on site, we were able to literally swim with dozens of great white sharks of various ages, observe their behavior, and document this research on film. In the truest sense, we were leveraging innovative technology to adapt to the shark's surroundings.

Evolution: Creating New Awareness

More recently, we took a team to study the ocean floor of the Florida Keys in the world's last remaining undersea marine research station—and lived underwater for 31 days. The idea of the habitat was not to stay inside, but to venture outside where we could work 10 to 12 hours a day and assimilate ourselves into the aquatic environment. The luxury of time allowed the native fish and other creatures to get comfortable with our station and with us.

And this is where technology, evolving technology, was put to great use in helping us study sea life and share it in real time with the world above. Maybe the lab itself was 25 years old, but it was equipped with tools to really advance our mission. We had a pulse-amplitude-modulated (PAM) fluorometer to gauge the effects of pollutants and water temperature on the health of corals. We used a state-of-the-art digital camera that shot a remarkable 20,000 frames per second to capture species biomechanics never seen with the naked eye.

Maybe most importantly, we took advantage of high-speed Wi-Fi that connected us with schoolchildren in China, the American Museum of Natural History in New York City, CNN, the Weather Channel—really, the public at large.

In that unique habitat, we conducted three years of scientific research in just over a month, resulting in 12 separate papers. But even more profound, we made a human-ocean connection that raised people's awareness of, and excitement about, ocean life, its magnificence and its ongoing challenges.

Diversification: Finding Alternate Ways to Survive

In nature, particularly in marine life, we've seen that adaptation and evolution aren't always enough, and that some species are faltering. The coral reef is a perfect example: coral bleaching is killing these precious organisms, which in turn is having a negative impact on fish and other sea life.

As part of a coral restoration program at our Ocean Learning Center, we are now using 3-D printing technology to create artificial reefs on which live coral can grow, to replace the dying or damaged coral reefs. And unlike past efforts, we're not using rebar, PVC piping, or zip ties to restore the coral. It's a completely green, environmentally safe approach to growing back the reefs.

We looked at the situation, observed the harmful effects other methods were having, and switched gears, going in another direction with another technology. I think that's what all organizations need to do when evaluating digital technologies as part of their own journey: look at the bigger picture, weigh the risks and rewards, and consider the far-reaching impact, beyond the bottom line.

Proceed with Eyes Wide Open

Today's global companies are continually developing and adopting new technologies and new processes, so that they can achieve more than ever before. But at the end of the day, it's not about the individual. It's not about a single entity or organization. It's about the community at large, and being disruptive and innovative together. It's vital that we remember to forge ahead in a positive direction and always be mindful of future generations—and the vast world that surrounds them.

About the Author Fabien Cousteau is an aquanaut, ocean conservationist, and documentary filmmaker. In early 2009 Fabien began working with local communities and children worldwide to help restore local water ecosystems. He continues to presently fulfill these initiatives through Fabien Cousteau Ocean Learning Center founded in early 2016 dedicated to the restoration of the world's water bodies through active community engagement and education.

"People protect what they love, they love what they understand, and they understand what they are taught." – Jacques-Yves Cousteau

The Fabien Cousteau Ocean Learning Center

The mission of the Fabien Cousteau Ocean Learning Center is to raise awareness, educate, and inform all citizens of the world on ways to protect and preserve the planet's waters and endangered marine habitats and marine life.
To learn more, visit **fabiencousteauolc.org.**

ANYONE CAN BE AN INNOVATOR. WHETHER IT'S TO IMPROVE YOUR BUSINESS, YOUR CAREER, OR THE LIVES OF MILLIONS, YOU HAVE EVERYTHING YOU NEED RIGHT THIS MINUTE TO MAKE LASTING, IMPACTFUL DIFFERENCE.

Mick Ebeling

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