IMMERSIVE TECHNOLOGIES: THEY'RE FOR REAL

VR AND AR DISRUPT TRADITIONAL INDUSTRIES

MORE THAN A GAME
Three weeks after launch, people had downloaded Pokémon Go more than 75 million times, generating more than $36.9 billion in revenue.

POKÉMON WENT
While AR made its initial splash in the consumer space with the introduction of Pokémon Go in July 2016, the enterprise sector will overtake consumer AR spending by 2021. By that time, the total AR market is expected to grow to $5.7 billion.

IMMERSIVE MARKETS
Beyond obvious markets such as videogames and movies, immersive technologies will shake up industries such as healthcare (3.4 million users by 2025), retail (32 million) and education (15 million

Immersive technology in the real world:

- **VisualSpection**'s wearable inspection technology allows workers to complete site assessments hands-free while tagging voice field notes, photos and videos with GPS coordinates.

- With the AR-enhanced virtual owner's manual for the 2015 **Hyundai** Sonata, owners can use their smartphones to see how to perform maintenance functions such as refilling wiper fluid and changing the air filter.

"Reality leaves a lot to the imagination," said John Lennon, a sentiment shared by researchers working in virtual reality (VR) and augmented reality (AR). These so-called immersive technologies will redefine how individuals interact with one another and with intelligent devices. They're easy to tell apart: AR systems add simulated features to the physical world (think Pokémon Go), while VR systems create a completely artificial world independent of the user's actual surroundings (think The Matrix).

The use cases for immersive technologies are varied and imaginative. Aerospace companies can showcase new aircraft at trade shows using AR holograms, avoiding thousands of dollars in freight costs, union labor and logistical support required to send the actual equipment. Retail store architects use VR to show precise sightlines and lighting patterns to optimize layouts before stores open.

The enterprise is starting to identify the potential cost and time savings of immersive technologies. A great example is augmented reality service, in which technicians are guided through repairs systematically and visually via AR headsets. Using immersive technologies, developers can add value to existing products and enhance the user experience faster and with less expense than would be required to create an entirely new offering.

While most enterprises are years away from viable immersive products and services, CIOs need to prepare now. Engage with VR/AR vendors to keep abreast of what's commercially available. Identify at least one ISV with VR/AR expertise and include them in strategic planning sessions. Launch a pilot program using immersive technology: You'll gain valuable experience no matter what the outcome. Consider the requirements of potential immersive initiatives when evaluating digital technology platforms. Your challenge is to stay abreast of developments in this rapidly evolving field so that you can provide guidance to business leaders as they explore VR and AR opportunities.

BLOCKCHAIN STEPS OUT OF BITCOIN'S SHADOW

GLOBAL DISRUPTERS EMBRACE BLOCKCHAIN

STARTING SMALL
The total worth of digital currencies is about USD $20 billion — just 0.025 percent of global gross domestic product (GDP).

GROWTH PREDICTED

"Bitcoin accepted here." You probably haven't seen this sign too often, but chances are you will. After several cycles of hype and disappointment, digital currencies are slowly but surely gaining a foothold. Today you can buy cleaning supplies at The Home Depot, pick out a gift at Shopify, book a flight on Expedia.com, hoist a draft ale at London's Pembury Tavern — and pay for it all with Bitcoin.

While digital currency has received much attention, the underlying technology — blockchain — may ultimately be the greater disrupter. Blockchain is a

PROTECTING THE FRANCHISE
91 percent of banks are investing in blockchain-enabled banking to protect against non-traditional market entrants.

How blockchain disrupts markets:

- Alibaba, China's largest e-commerce enterprise, plans to finance more than USD $125 million in deals over the next 12 months with blockchain-enabled services.
- The government of Honduras is reducing fraud in land title registration by replacing paper documents with tamper-proof digital records based on blockchains.
- One global healthcare technology manufacturer is prototyping a model using blockchains to allow individuals to maintain control of their medical records in a secure digital wallet.

ogy — blockchain — may ultimately be the greater disrupter. Blockchain is a distributive ledger system for tracking transactions without a central authority. Eliminating intermediate agents increases security, decreases transaction time, and reduces processing costs.

Blockchain is already transforming the financial services industry. Traditional banks are implementing blockchains to streamline back-end processing and reduce costs dramatically. Banking startups are eyeing the technology. And they are siphoning blockchain experts from major banks.

The broader implications are staggering. Twenty-first century enterprises will abandon vertically integrated hierarchies for a peer-to-peer, networked structure. Even the Internet of Things will be touched by blockchain technology: As one pundit says, "It turns out that this Internet of everything needs a ledger of everything."

While the blockchain revolution is currently focused on financial services, it will soon touch applications such as music distribution, identity verification, and supply chain. Forward-looking CIOs are pushing ahead to identify use cases, initiate proofs of concept, and develop staffing plans. It's quite possible that some will pay for these initiatives with digital currencies — a nice bit of serendipity.

UBIQUITOUS SENSORS: INTERNET OF THINGS

GET SMART FAST— OR GET LEFT BEHIND

WASTED OPPORTUNITIES
Companies discard 99% of data before decision-makers have a chance to use it. By doing so, businesses are missing out on potentially dynamic intelligence to drive product innovation, decrease after-sales costs and improve customer satisfaction.

CAN YOU HEAR ME NOW?
By 2020, there will be 6.1 billion smartphone users globally, approaching the projected world population of 8.1 billion people.

DRIVING WHILE INTELLIGENT
By 2020, 90% of cars will be online, creating market opportunities for in-car

Everyone has heard about the Internet of things (IoT) — but what is it, exactly? One useful definition is "for everything in the world to basically be a computer, whether it's your contact lens, your hospital bed, or a railway track."

The math is mind-numbing: Depending on whom you believe, the number of connected devices in 2020 will be either 50 billion (Cisco's prediction) or 200 billion (Intel). Sensors in just about everything, from refrigerators and thermostats to automobiles and roadways, will merrily churn out petabytes of data every second — data that somebody, somewhere, somehow, must manage and, ideally, interpret and use.

Seen from that perspective, CIOs and chief data officers (CDOs) can expect their enterprises soon to be drowning in a sea of data of almost unimaginable proportions. Companies that extract value from their data will have a substantial competitive edge over those who don't. But how can they accomplish this task?

For starters, CIOs must reinvent their data processing infrastructure. Simply adding more computing power to existing computational paradigms won't do the trick — entirely new technologies such as cognitive computing and

market opportunities for in-car infotainment, autonomous driving, and embedded devices.

Solving massive problems with IoT and intelligent things:

- In Beijing, an initiative called Green Horizons used real-time data from environmental sensors, satellites and traffic cameras to create accurate predictions of air quality and reduce harmful particulates by 20% in 2015.
- GE offers predictive maintenance and optimization services for more than $1 trillion worth of Internet-connected industrial equipment, ranging from

even quantum computing will be required. CDOs will turn to the emerging field of IoT analytics to catalog, manage, secure and interpret information. Technologies such as blockchain and adaptive security will find their place in an IoT world.

To be successful in this rapidly evolving IoT space, CIOs and CDOs must adopt a strategic approach. A good strategy is to use sensors and intelligent things to streamline existing workflows and processes. A great strategy is to develop innovative ways to leverage the Internet of things to enter non-traditional markets and even create new ones. It's no longer enough to think outside the box—now you need to make your own box.

The Platform Is the Innovation

GO DIGITAL OR GO HOME

Going strong: The digital economy will account for 25 percent of the global economy by 2020, up from 15 percent in 2005.

Howdy, partner: By 2018, more than 50 percent of large enterprises—and more than 80 percent of enterprises with advanced digital transformation strategies—will create or partner with digital platforms.

Born digital to run: The top 15 BDOs have a combined market cap of USD $2.5T. By comparison, the same figure for the top 15 Internet companies is USD $16B, just 0.64 percent as much as their BDO cousins.

It's the platform, stupid:
- **No need to own:** The Apple iOS App Store comprises nearly 380,000 independent developers that have created 1.5 million applications. Apple is successfully generating more than a billion dollars a year from this ecosystem using resources it does not own.
- **To your health:** Philips has a bold vision to reinvent healthcare without reinventing the wheel. Using an IoT platform supported by three cloud partners, Philips

At times, technology hype is so egregious that one can be forgiven for nodding off at bold claims such as: "Platform business models represent the most profound disruptive change in the global macroeconomic environment since the Industrial Revolution."

However, you might want to stay awake for this one. Business leaders and analysts agree that digital technology platforms are becoming critical innovation drivers in every industry, from Alphabet, Salesforce, and other born-digital organizations to mainstream corporations such as Caterpillar, Walgreen's and Goldman Sachs. Soon every business that's still in business will be a digital business – yours included.

Think of a digital technology platform as a collection of components built to enable a specific digital business model. They come in flavors, for example, business ecosystem platforms support the creation of external ecosystems, marketplaces and communities. Other types include Internet of Things platforms, analytics platforms and customer experience platforms.

Platforms and models go hand in hand. The new breed of platform-driven business models create value through the interaction of the platform with an ecosystem of developers, publishers, content owners and others. In short, companies can create value by tapping into resources and capacity that they don't have to own.

Once the sole province of high-technology enterprises, digital technology platforms are going mainstream. If you are an IT leader, start by mapping each of your organization's strategic objectives to a specific form of digital technology platform. Next, determine what platform capabilities must be modified or added to meet your requirements, for example, IoT initiatives may require adaptive security. The results of that exercise will inform the technology roadmap required to support your digital business. You may not know it, but there's a good chance that your competitors have already started. Now is no time for complacency.

can rapidly scale up to hundreds of millions of patients, devices and sensors while concentrating its developer resources on healthcare innovations instead of IT infrastructure.

DOUBLING DOWN ON DIGITAL TWINS

IT'S TWINS!
HOW COMPANIES ARE ADAPTING

DRILL, BABY, DRILL
A typical offshore oil rig has 30,000 sensors, yet only 1% of the data informs decision-making. By feeding this real-time information into a digital twin, operators can better estimate maintenance requirements, reducing downtime by 50% and costs by 40%.

HAVE A HEART
Dassault Systèmes, a French software company, set out to build a digital twin of the human heart. Two years and 208,561 digital tetrahedrons later, their highly accurate Living Heart allows researchers to work inside this most vital of organs—without putting on scrubs.

BLOWING IN THE WIND
Norway's Arctic Wind uses enormous turbines — each blade weighs 10 tons — to coax energy from 100 mile-per-hour winds at temperatures as low as -25 degrees Fahrenheit. Failures are costly, but so are premature inspection shutdowns. A digital twin uses real-time sensor data to model the physical turbine, replacing the need for physical inspections with digital inspections.

IS IT HOT IN HERE?

A typical steam turbine operates at 3,000 degrees Fahrenheit, so it takes up to six weeks for the machine to be cool enough for repairs. To time maintenance cycles accurately and avoid needless downtime, operators rely on a digital twin.

As the U.S. space program reaches farther into the solar system and beyond, spacecraft must get lighter and withstand more extreme conditions over longer periods of time. To meet this challenge, NASA has embraced the digital twin: a software model that exactly mirrors the physical spacecraft at launch time and uses sensor data for continuous updates. It's the closest thing to being on board, allowing engineers to better monitor operations and take proactive steps to reduce risks for these complex and expensive missions.

Now digital doppelgangers are coming to a location near you. By 2020, hundreds of millions of digital twins will be hard at work, operating factories, planning service regimens and helping designers improve product quality. We may even have personal digital twins to assist doctors with diagnoses and treatment planning. (Sadly, you'll still have to go to the dentist yourself.)

Digital twins differ from engineering simulations in that they deliver benefits over the lifetime of the asset, from lower prototyping costs to more accurate failure predictions and reduced downtime. By unifying once-siloed disciplines such as design engineering, quality assurance, performance monitoring and diagnostics, digital twins increase productivity, enhance product quality and create competitive advantage.

CIOs and CDOs would do well to begin to lay the groundwork now. Develop a holistic approach to store, manage and manipulate the massive amount of data required to sustain a digital twin. Institute a robust engineering change management process to ensure that digital twins accurately reflect their corresponding physical assets. While the precise use cases for most industries are yet to be defined, digital twins promise to be a disruptive force in the enterprise on a scale not unlike that of a parallel trend, the rise of digital labor.