



IT IS INNOVATION

MAY/JUNE 2021



FORD MOTOR COMPANY'S
CHIEF DIVERSITY OFFICER
AND DIRECTOR
OF PEOPLE STRATEGY

Lori Costew

Cultivating a culture of belonging

Consumer
Technology
Association™



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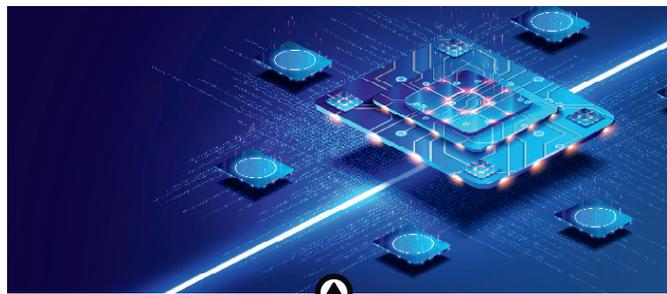
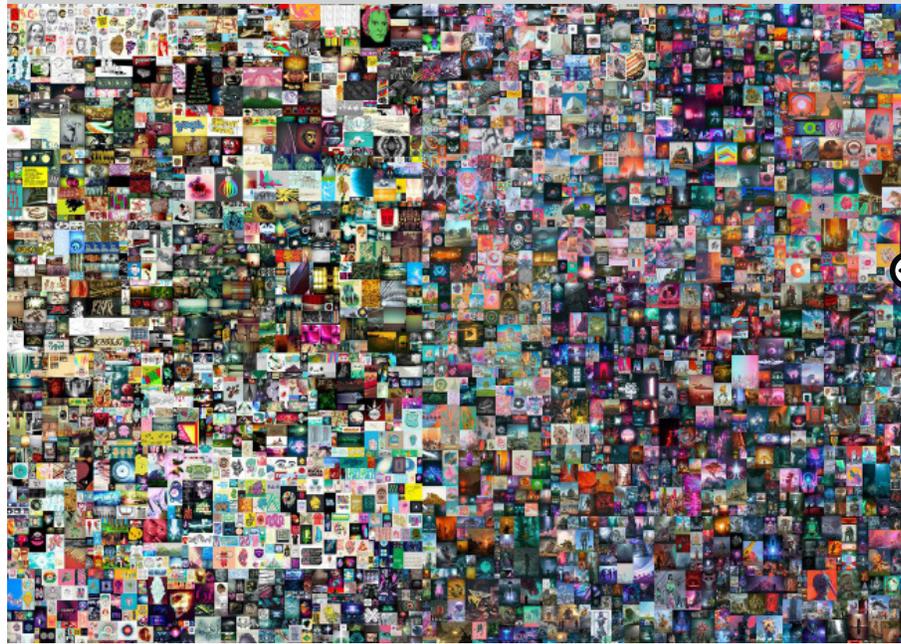
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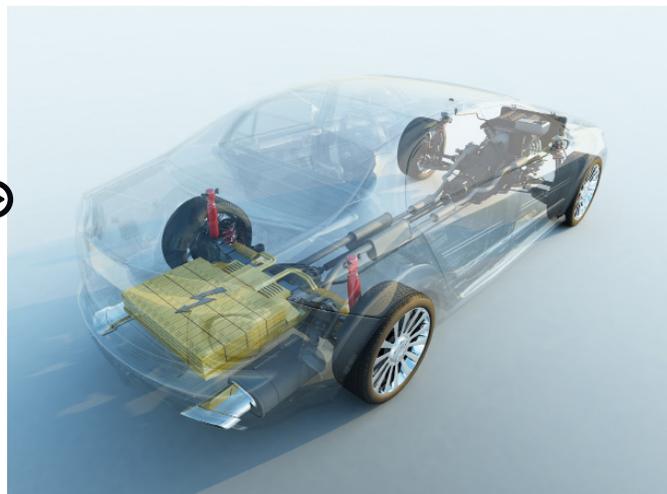
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Lori Costew, Ford Motors
Photo courtesy of Ford Motors



Consumer Technology Association™



Biden's China Challenge



Rawf8/Getty



“
The best course is to plan for increasing U.S.-China tensions and shift from sole sources of supply.
”

China is the world's manufacturer. But if American political leaders get their way, Americans will buy fewer Chinese products each year. Republicans and Democrats agree that Chinese ascendancy endangers our economy and national security. More, China's efforts to subsume Taiwan and Hong Kong combined with its Belt and Road Initiative and global expansionism, and harsh deals with developing countries guarantee increasing tension with the West.

This tension stems directly from Chinese President Xi's strategies and policies. He created concentration or "re-education camps" for Muslim Uyghurs, blocked American social media companies and walled off the global internet so Chinese citizens can't access facts or political criticism, tightened press control so unfavorable or even factual stories cannot be written and began social rating of all Chinese citizens. Under Xi, dissidents disappear, the Constitution changed to give him greater longevity and control, and China is trying to test and expand its borders. Xi also kept COVID a secret from the world, continues to frustrate WHO investigators and only let them investigate in China if they kept alive the unsupported theory that COVID came from frozen meat imports to China. Meanwhile, several devastating cybersecurity intrusions to U.S. institutions are believed to have emanated in China.

An evil, expansionist China matters to countries which cherish basic human rights. Americans, along with our western allies, value their right to choose for whom they vote, read and give different points of view, practice their religion, maintain their privacy, and marry whom they want. Our very way of life relies on these freedoms and China's growing economic success, expansionism and increasing repression globally threatens these rights.

President Trump's administration acted forcefully against China, but focused mostly on China's economic threat. Trump did penalize Chinese companies for building technology enabling the Uyghur concentration camps but rarely spoke about China's human rights abuses. Trump focused mostly on economic issues with bluster, bravado and harmful tariffs. In fact, his unpredictable actions did more to drive business crazy than accomplish any real dent in Chinese policies. But Trump deserves credit for accelerating the move of many companies to build products in Vietnam, Indonesia and other countries. However, few if any companies moved manufacturing back to the U.S. Trump

did create a couple of partial trade deals with China which appear to have been more bravado than substance and in any case the agreement's ambiguity and COVID may have cleansed the Chinese commitments to buy more U.S. goods.

Candidate and President Biden vowed to rein China in and shift manufacturing to the U.S. with a combination of tax and other incentives. The Biden administration has identified certain high-tech categories as important for national security worthy of a type of industrial policy with government investment. President Biden has implied he is in no hurry to remove the Trump tariffs from products imported from China. He seems eager to put Chinese human rights and labor abuses on the table. But President Biden thus far has barely spoken in public on most issues. As of this writing he has not held a press conference since January 20, seems overly controlled by his aides, and appears to be more focused on domestic issues and putting out national security fires.

In any case, more shoes will drop unless China unexpectedly shifts its human rights and mercantilist approach to the world. With politicians and Americans united on the threat from China and President Biden most responsive to American unions, we should expect increasing roadblocks on importing products from China. The best course is to plan for increasing U.S.-China tensions and shift from sole sources of supply.

Gary Shapiro,
President and CEO



Tech Enhancing Lives

Summer is here and we are in the early stages of opening up the country after the pandemic. We are ready to embrace the warm weather and be outside with others, and companies also are looking to partner, collaborate to leverage disruptive change and form strategies to build on new technologies.

Unfortunately, we also are experiencing delays and shortages in the supply chain, particularly with the semiconductor chips that are used in many consumer technology applications including vehicles and PCs. Consumer spending behaviors fueled by remote work, virtual education and entertain-at-home trends during the pandemic had unpredictable consequences as well as factors like the pipeline hack that drove gas prices higher and other cyberattacks that include unforeseen effects. This situation has highlighted weaknesses in the U.S. tech ecosystem, specifically, dependence on overseas wafer and fab companies, and CTA predicts the chip shortages will last through the end of this year. Read CTA's findings in our policy section.

However, innovation continues to be the backbone of the economy as we look at new strategies automakers are using to extract more range than ever from EVs driving us closer to an electric future. We also take a look at the recent fascination with non-fungible tokens (NFTs) and how value is being embedded in the blockchain for digital art, music and entertainment at sometimes astronomical prices. In this issue we also sat down with Chief Diversity Officer and Director of People Strategy at Ford Motor Company Lori Costew for a conversation about the

company's focus on diversity, equity and inclusion strategies. She also is the author of several inspiring books for children. And Chief Digital Officer and Vice President at Caterpillar Inc., Ogi Redzic, shared how the company's autonomous technology has improved safety and increased productivity for its customers. We also look at how the deployment of self-driving vehicles will increase efficiency and productivity, reduce time spent in traffic, boost the economy and create millions of jobs — a compelling proposition going forward.

And finally we examine interfaces that one day could connect our laptops to our brains without a keyboard as well as augmented reality and virtual reality reenergized with new applications and CTA's latest research on the future of retail. In *i3*'s Market Beat column, see how digital payment systems, cashier-less stores and even AR may soon become a familiar component in retail strategy. We want to hear from you. Please send comments to: cstevens@CTA.tech.

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INNOVATOR

Ford's **Lori Costew** On Belonging

Lori Costew is the chief diversity officer and director of people strategy at Ford Motor Company. Her portfolio focuses on the company's diversity, equity and inclusion (DEI) strategy. She assumed this role in June 2019 to cultivate a culture of belonging and advance the organization's mission and business objectives. Costew also ensures Ford's talent strategy supports corporate goals and transformation efforts.

Previously, Costew held positions within Ford leading human resources for the organization's mobility division, as well as The Lincoln Motor Company. Costew joined Ford in 1993 and for nearly three decades has worked in positions supporting marketing, UAW negotiations, equal employment planning and organizational development. Costew is also the author of two award-winning novels that provide inspiration and tools against bullying for children. Her first book is "Sherpa's Adventure: Saving the Future" and the sequel is, "Sherpa's Adventure: Destroying the Hologram."

Costew has a master's degree in human resources from The Ohio State University and a certification in executive coaching from the Hudson Institute. Born a Buckeye, she lives in Northville, Michigan with her husband and two children. She joins *i3* to discuss the importance of belonging and inclusion.

Q. How has making D&I a business imperative helped make your company stronger?

A. Great talent can go anywhere. At Ford, we know that it takes many different perspectives and backgrounds to create the innovative products, services and experiences our customers want. Finding and retaining those diverse voices is the only way to transform our company and deliver on our corporate strategy. To be successful, we must create a culture of belonging where everyone can bring their authentic selves to work.

Q. How are you working with employees and community partners to advance diversity and inclusion?

A. Internally, my team within the DEI Office advances diversity, equity and inclusion by working closely with our 11 employee resources groups (ERGs). While our ERGs have a proud history of serving and supporting their members and communities, we are capitalizing on the strengths of their lived expertise to help solve business problems and reach customers in new ways. We lead governance of DEI-related activities across the enterprise, provide experiences and events designed to educate and raise the awareness of all employees, create prototypes to improve the employee experience from recruitment to departure, and attract future diverse talent by engaging with professional organizations, historically Black colleges and universities (HBCUs), and using software to support inclusiveness and gender neutrality.



Courtesy of Ford Motors



What is your advice for companies beginning their D&I strategy?

A For companies big and small across all industries my advice is to start by listening deeply.

Leaders must create a safe space for people to share their life experiences inside and outside of your company. You will gain empathy and insights into the space between what you think your culture is, and how it is really experienced by others. Then you can focus your efforts to implement the most relevant, impactful solutions.

Externally, my team shares our work in the sector through the Ford Fund, the philanthropic arm of the company. From providing contributions to food banks and other organizations after natural disasters, to the #FinishStrong campaign donating masks to every state in our nation to counter the COVID-19 pandemic, we are able to impact many underserved communities. Ford is also proud of our decades-long, significant investments in STEM (Science, Technology, Engineering and Math) and entrepreneurial community initiatives that affect lives every day.

Q. As you look to the future, what are some key lessons learned?

A. George Floyd's death was an awakening for so many of us. In response to the moment, we launched the U.S. salaried DEI audit, part of a comprehensive, global examination of the employee experience. This process revealed that many women, Black and Hispanic employees felt excluded and faced unique barriers along the employee journey. Listening deeply was critical. We held many listening sessions and focus groups that provided insightful observations on our company culture. The sessions, combined with workforce and policy evaluation data, taught us that we must lead with a culture of belonging for everyone and establish governance, transparency and accountability. The experience brought us to our North Star, the framework for DEI work, and the guide to the following mantra: "We are family. We celebrate our differences. We all belong." ■

INTERNATIONAL FOCUS

SINGAPORE



Singapore actually includes the city of Singapore, the state of Singapore, and the country (Republic) of Singapore. It is one of the busiest ports in the world, as well as the largest in Southeast Asia. A very diverse country with a population of 5.7 million, Singapore has four official languages — English, Mandarin Chinese, Malay and Tamil.

No Singaporean Left Behind

Guidelines were developed by government-linked agency Council for Third Age (C3A) and the Singapore University of Social Sciences to make it easier for older adults to learn technology skills. C3A administers the National Silver Academy, which is a network of educational institutions and community-based organizations offering subsidized learning opportunities for those aged 50 and older. Singapore is again on top on Roland Berger's "Digital Inclusion" index improving its scores for accessibility, affordability and ability.

Singapore Uses Blockchain to Improve Pandemic Travel

Singapore is using blockchain to remove some stress from travel. Singapore's Smart Nation and Digital Government Office (SNDGO) and Ministry of Health developed a global standard for HealthCerts, a document verification system, that shows proof of recent COVID-19 tests. The test results are available on the government's digital identity mobile app SingPass. Singapore wants to use the system as proof of vaccination status around the world. The technology is already used by some universities to confirm graduation status.

SINGAPORE STARTUPS

Singapore's startup ecosystem exceeds the global average of \$10.5 billion, totaling some \$21 billion in value. Asaf Fybish of StartupStash says the primary reasons are the ease of doing business, pro-business policies and an efficient tax system. For example, under the Startup Tax Exemption Scheme, 75% of a company's first \$73,000 in income is not taxed. Digital health and fintech are two strong categories for startups. For instance, Nervotec's new app measures heart rate, oxygen saturation, respiration rate and stress levels with high-end accuracy. As a complement to COVID-19 temperature screenings, it uses light to detect vital signs.

Singapore Serves Lab-Grown Meat

Some people are seeking alternatives to meat because of concerns for their health, animal welfare and the environment. Singapore is the first country to offer "cultured meat" in restaurants. This menu item is different than plant-based products that imitate meat, since it is grown from animal muscle cells in a lab in a bioreactor. Dishes cost about \$17 (US), and includes a crispy chicken bao and a maple waffle chicken dish. Using technology to increase food production brings Singapore closer to reaching its goal of feeding one-third of the country by 2030, with home-grown options. Singapore currently produces about 10% of its own food.

▶ CES 2021 STARTUP EXHIBITOR



Singapore's Oxytap

Located in Singapore, CES exhibitor and startup Oxytap says, "We make water better." Oxytap combines dissolved oxygen into drinking water, for what many believe is a better-tasting, healthier drink. Expensive cartridges and tanks are not required to make drinking water taste as fresh as from a mountain stream in just three minutes. It's not acidic, like carbonated waters, which can erode tooth enamel. Featuring a small footprint, Oxytap fits on a countertop so it's easy to start your own in-home oxygen therapy.

Clockwise from top left: Peter Hermes Furian/Shutterstock; Supermap/Shutterstock; Courtesy of Oxytap.

C4 TRENDS

VR, AR: Reenergized

Augmented reality (AR) and virtual reality (VR) are emerging in new ways.



Who can forget the fanfare when AR and VR first launched focused on futuristic entertainment experiences — Google Glass, the cardboard VR viewer or the first Oculus Rift, HoloLens? The AR/VR market is now forecast to grow from \$13 billion in 2020 to over \$67 billion by 2024, according to Digi-Capital.

The evolution of these technologies highlights their diverse use cases. AR delivers a modified view of the real physical world while VR delivers a unique experience in a virtual world. AR provides computer-generated context and information about the world letting users interact with ‘real’ surroundings. While VR allows users to interact with immersive worlds enabling people to learn new skills through simulation. For now, VR’s entertainment focus makes it a subset of the consumer games market, with VR apps on Steam, Facebook/Oculus and Sony app stores.

Mobile AR

During the pandemic, mobile AR showed what is possible for AR-enabled messaging platforms with Facebook Messenger, Instagram, TikTok and Snapchat as examples. While each has a different approach to user engagement, usage frequency for AR lenses and filters is high, with Snap claiming more than 170 million users daily, based on its June 2020 Developer Conference. Smart glasses with integrated displays may be coming soon — fully computer capable yet lightweight, stylish and wireless. Other form factors in the works include smart contact lenses.

Digi-Capital forecasts that messaging-based mobile AR’s active installed base will top 1.5 billion by 2024, OS-based

mobile AR over one billion by 2024, followed by web-based mobile AR. All mobile AR platforms combined could top 2.7 billion in five years. Many companies are involved in this space including:

- **Nintendo-Niantic** agreed to jointly develop apps featuring AR aimed at providing real-world activities for players. The companies are introducing an app based on the puzzle video game franchise Pikmin. Launching this year, it includes activities to “make walking more delightful.”
- **Apple** reportedly has an AR/VR research team working on projects that could be implemented into future iOS devices including a headset or AR smart glasses to be released in 2022. Apple has a stable of AR and VR patents, and expertise gained through acquisitions including Akonia Holographics, Emotient, Faceshift, Flyby Media, Metaio, NextVR, PrimeSense, RealFace, Spaces and Vrvana.
- **Facebook Reality Labs** is developing a wrist-based wearable interface for AR glasses using software that can read nerve impulses. Developed by CTRL-Labs, acquired by Facebook in 2019, the work is part of research into human computer interaction technologies. This could lead to AR glasses as an always-accessible, reliable neural interface with subtle hand

motion controls that may potentially replace keyboards or TV remotes.

- **Google’s** Earth VR puts the world at your fingertips. Its Tilt Brush enables you to paint in 3D space with VR and is compatible with Oculus and HTC Vive.

Reimagining Digital Shopping

In May 2020, Kohl’s collaborated with Snapchat to create Kohl’s AR Virtual Closet. Using a smartphone and the Snapchat app, consumers enter an AR dressing room, mix and match items, and make a purchase from home using the app.

Retailers like IKEA and Wayfair have AR apps that display how furniture would look in your home. Louis Vuitton and Gucci offer apps that let consumers ‘try-before-you-buy’ from home. And when COVID-19 temporarily closed Kendra Scott jewelry brand stores, the retailer introduced an AR tool letting customers virtually try-on jewelry at home and then purchase. Beauty retailers Sephora and Ulta are using AR to help customers digitally test beauty products since customers can’t physically test instore currently.

These are just a few applications but health care also holds enormous promise. Opportunities in this new ecosystem including new developers, suppliers and channels will grow as AR/VR uses continue to evolve. ■

A TECH TO WATCH

Connecting our Laptops to our Brains?

Why analysts are optimistic about user interface technology



“
A combination of iris, vein, fingerprint, facial recognition and voiceprint interfaces for verification offer extra security without compromising the user experience.
”

Will we one day communicate directly with our devices without lifting a finger? As the point of human-computer interaction, consumers today expect the user interface (UI) on their devices to be intuitive and easy to use.

But smaller and more powerful portable and wearable devices is challenging the continuous power requirements of UIs by substituting a design that offers lower power consumption compared to always-on displays. This allows for power resources to be dedicated to performance and functionality.

The global UI service market is dominated by the consumer tech segment followed by education and health care, according to Market Research Future (MRFR) based in Maharashtra, India. The firm predicts the global UI market size will touch US \$50 billion at a 16% CAGR between 2019 and 2027.

MRFR estimates the UI market is on the cusp of significant change — it will not be limited to screens anymore. Rather interactions will provide a real-world experience. Virtual reality (VR) has primarily been used in gaming but it now is also being employed in the health care and education sectors.

Frost & Sullivan's report, *Future of User Interfaces Shaping New Consumer Experiences* found UIs have moved beyond the concept of merely representing machines to their users to enabling sophisticated and personalized interactions. Frost & Sullivan believes biometric technologies will drive growth opportunities as the adoption rate rises and organizations realize the productivity

gains UIs make possible. As vendors integrate biometric technologies with artificial intelligence (AI) and machine learning, it will create a strong market for high-end biometric interfaces.

A combination of iris, vein, fingerprint and palm, facial recognition and voiceprint interfaces for verification offer extra security without compromising the user experience. Successful implementations, however, will require high-speed communication networks. Frost and Sullivan predicts global biometrics market revenue will reach nearly \$55 billion in 2025.

Further Down the Road

Interfaces that connect human brains to computers could arrive in the next few years. Neural interfaces could have a significant impact on the restoration of vision and hearing, treatment of mental health disorders, and alleviating pain through electrical stimuli by focusing on the appropriate areas of the brain.

The gaming community also is pioneering new gaming control mechanisms based on brain signals using electroencephalography (EEG) headsets.

Just this past year, Elon Musk's company Neuralink demonstrated that brain link UI technology is possible. Neuralink is developing a whole brain interface using an implanted chip to allow a user to communicate wirelessly with the

cloud, computers and in theory with anyone who has a similar interface.

With a small brain-to-computer implant embedded in her snout, the “Cyberpig” Gertrude can wirelessly transmit her brain activity to a computer. The pig's brain implants were surgically added without any detriment to her health.

Next-Generation Gesture Interfaces

With gesture interfaces, you do not need to physically touch a device. With a simple finger, hand or body movement, various actions are executed.

Apple has been working on in-air gesturing for years. Recently the company was granted a patent for a Hand Gesturing Based User Interface. Apple's gesture-based UI includes a movement monitor configured to observe a user's hand and to provide a signal based on the hand movements. A processor is configured to actuate different commands in which a cursor, in response to the signals from the movement monitor, moves within the display.

According to the patent, beyond hand gesturing, the invention could be in context with other future movements such as leg and finger movements.

UI's will continue to evolve to satisfy the needs of end users but how we connect to our devices in the future remains to be seen. ■

PIPE LINE

Standards Address Emerging Technologies



You probably know that CTA has worked with industry to drive innovation for decades, and you may have even celebrated this legacy at the 50th anniversary of CES in 2017. But did you know that CTA's roots go back to 1924 with the founding of the Radio Manufacturers Association, and developing standards with industry has been part of CTA's mission since the start?

There are three dynamic traits of CTA's Technology & Standards program that reflect the vibrancy and importance of the consumer technology industry. They are the sheer breadth of CTA's standards work; the power of combining CTA's policy work, membership groups and standards programs; and the flexibility to tackle emerging technology while supporting established product categories.

These factors — policy topics and membership activities informing and being empowered by CTA's standards work — have driven rapid growth. CTA has launched new efforts to develop and publish standards for artificial intelligence (AI), augmented reality (AR), virtual reality (VR) and extended reality (XR), accessibility, digital health and cybersecurity. The industry is determined to address needs in these market segments and stepped up to publish 15% more standards in 2020 than the prior year despite the duress and uncertainty caused by the pandemic. In fact, the industry responded directly to the pandemic by launching new standards projects for a vital signs toolkit and respiration monitoring solutions.

Proposals for new standards do not always come from standards insiders. Sometimes policy experts see an opening where industry-led standards offer a preferred solution over government

mandates. Televisions draw a lot of regulatory scrutiny, including how much power they use. A prime example of the intersection of policy and standards is CTA's facilitation of a milestone agreement between manufacturers and energy efficiency advocates to develop and promote a new TV energy measurement test method. That policy agreement, which intends to lead to voluntary energy use targets, triggered a project to revise CTA's standard for determining TV power consumption.

CTA's Technology & Standards Forum

CTA's standards work anchors the semi-annual CTA Technology & Standards (T&S) Forum. These events feature informative sessions, networking opportunities and committee meetings. They're important milestones where innovative thinkers from the consumer technology industry meet to discuss pressing issues and collaborate to solve them.

At the most recent Spring T&S Forum in early May, information sessions addressed future standards for digital therapeutics; mental health and the virtual care evolution; mitigating bias through inclusive design; the role of data in addressing public health emergencies; and combating deepfakes. Committee meetings covered AI, cybersecurity, digital

Proposals for new standards do not always come from standards insiders. Sometimes policy experts see an opening where industry-led standards offer a preferred solution over government mandates.

health, streaming media, energy efficiency, XR and much more.

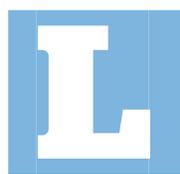
Since the pandemic started CTA's Forums have been all-digital. The creativity and efficiency of in-person meetings has been sorely missed, but the convenience of an online event has allowed more people to participate in T&S Forums. We look forward to hosting the Fall T&S Forum, whether it is held online or in person, as it will be our capstone technical event for 2021 and preview important projects for 2022. Check out [CTA.tech/events](https://cta.tech/events) for the latest information on the T&S Forum and other CTA events. ■



THE **NFT** FASCINATION

By **Gary Arlen**

Putting blockchain value on digital art, music and entertainment



ikely you have heard about non-fungible tokens (NFTs), the blockchain offshoot.

These units of data are stored on the blockchain digital ledger that certifies the asset is unique and therefore not interchangeable. NFTs can represent items such as photos, videos, audio and other types of digital files.

Access to a copy of the original file, however, is not restricted to the buyer of an NFT. While copies of these digital items are available for anyone to obtain, NFTs are tracked on blockchains to provide a proof of ownership that is separate from copyright.

Although NFTs have been around for nearly a decade, their profile has ascended in the past six months thanks to celebrity connections and astronomically priced sales. Some analysts tied the NFT flurry to renewed interest in cryptocurrencies and blockchain developments, which flourished during the pandemic. By one reckoning, the NFT market is exceeding \$400 million in the first three months of this year, up from \$42 million in 2018.

The role of institutions, such as Christie's auction house, has added validity to the emerging NFT world, not to mention that Beeple's (actually Mike Winkelman) "Everydays" artwork was the third-most expensive work ever sold by a living artist.

"This young industry is closely followed by global companies," explains NonFungible.com, which tracks the NFT entry of media, financial and entertainment firms — ranging from Major League Baseball to video-game publishers to attire companies like Nike. Its report emphasizes, it is vital "to understand the forces that are driving the development."

Nonetheless, the digital volatility has attracted some of the biggest names in technology finance to NFTs. Peter Thiel's Founders Fund is a sizeable investor in OpenSeas, the largest NFT marketplace. The Winklevoss twins own Nifty Gateway, another NFT market.

The shock and awe of the NFT value frenzy has also forced creators, sellers, buyers and intermediaries to explore the array of factors that accompany a new tech product that involves intellectual property, financial and investment issues, regulatory and legislative oversight (for copyright, global trade plus more) and even environmental impact — not to mention aesthetic controversies surrounding the "digital ephemera" as the *New York Times* called it.

As media attention has accelerated, fueled by the sums being paid for intangible collectibles, some critics scoffed that NFTs images, music performances and sports clips are easily accessible in other digital forms at low or no cost. That criticism overlooks the reality: NFTs are about "ownership." It's hard for some observers to grasp that an intangible item can have the same worth as something you can hold in your hands. NFTs are demonstrably unique, thanks to their blockchain coding, hence



When did you first hear about NFTs — the hot trend that has attracted investors this year? Here are a few examples:



... **Beeple's** \$69.3 million NFT digital painting "Everydays: The First 5,000 Days" auctioned at Christie's in March, and a week earlier at a Beeple \$6.6 million NFT art sale.

Electronic music producer 3LAU (pronounced "Blau") sold \$11.6 million in NFTs, including a tokenized edition of his "Ultraviolet" album.



... **José Delbo**, an 87-year-old artist who illustrates comic books, netted \$1.85 million in an NFT auction of unlicensed **Wonder Woman** art in March. That followed Delbo's exhibit of comic art in an Ethereum-based virtual reality world last July.



... **"Nyan Cat"** (an animated flying cat with a PopTart body) in a new NFT form sold for \$580,000 in a cryptocurrency transaction in March.

... **Twitter founder/CEO Jack Dorsey** offered to sell an NFT of his first Tweet ("just setting up my twttr" in 2006) for \$2.5 million in March on the Valuables platform.



Musician/artist Grimes sold \$6 million in NFT **digital music and artworks** (including animations, poems and video clips) in February. One of her 50-second videos sold for \$390,000.

The LeBron James jump-shot short video sold for \$208,000 in February via the NBA's Top Shot NFT venture.



... **Steve Aoki's "Dream Catcher"** art collection generated \$4.25 million in sales, with a notable \$888,888.88 paid for one piece by former T-Mobile CEO John Legere.

Paris Hilton's hand-drawn cryptograph **portrait of her cat Munchkin** fetched 40 Ether (about \$17,000) last August.

At a Museum of Crypto Art auction last July, a series of virtual paintings called "**Picasso's Bull**" by **Trevor Jones** sold for \$55,555 — a sizeable increase from the original price of \$750 per item.



CryptoKitties from **Dappler Labs**, the first functional NFT implementation, appeared in 2017.

"**Colored Coins**" popped up in 2012 as small parts of Bitcoin. The Colored Coins gestated the NFT concept as a permissioned environment and led to a platform called Counterparty in 2014.

The Mark Cuban Twitter post sold for \$952 and the **Lindsay Lohan portrait** brought in \$17,000.

they have distinct value, even though other collectors may have access to a similar item.

It's easy to understand that an original Monet can sell for hundreds of millions of dollars, while a high-quality reproduction costs a hundred dollars at a museum shop or a poster reproduction of the same image costs less than \$10. Each version brings joy commensurate with what was spent.

NFTs, like other blockchain products, start when a creator "mints" his or her digital art/music/game/other product using encryption technology that makes it impossible to copy the "token" imprint on it. As a result, the one-of-a-kind original digital artwork, music performance or sports activity can only be registered to one owner, although others can see or hear another version of that digital original. The owner has bragging rights to the unerasable, blockchain record of the asset plus access to the actual asset.

Transferring that value regression to digital content is more challenging. What's different, skeptics ask, about seeing LeBron James dunk a basketball via an ESPN or YouTube video rather than having a personalized video clip of that shot? Or why is it better to own a digital file of a Banksy "Morons" NFT image if you can see the same material on a website? The same question applies to the Kings of Leon album "When You See Yourself" which sold for \$50 each as NFTs in just two weeks in March; after that release, no more copies were made. The group netted \$2 million in NFT sales for that album.

"NFTs enable entirely new forms of creativity, connection, access and exclusivity," says Peter Csathy, chairman of CREATV Media, a San Diego media and entertainment merger and acquisitions advisory firm. "That means lucrative new ways for artists to earn a living – directly via their fans."

Csathy expects that NFTs will be part of a new "massive direct artist-fan investment opportunity." He envisions digitally-driven NFTs, virtual engagement and patronage plus limited-edition collectibles to generate "an entirely new, unprecedented level" of fan/performer relationships "enabled and accelerated by virtual."

"Think of the virtual/tangible possibilities, where passionate superfans happily pay premium prices to support and get ever-closer to the artists they love in all modes of engagement," Csathy says.

LEVERAGING THE CRYPTOCURRENCY BOOM

NFTs represent the next step in the digital transformation and perception of "value" and "worth." They represent assets in digital artworks, music, in-game items and other virtual collectibles and are an offshoot of the cryptocurrency upturn during the pandemic.

"Art has been an asset of the wealthy for centuries," says Seth Shapiro, founder and CEO of Artaku Corp. "Now there is a worldwide cadre of investors who bought Bitcoin or Ethereum, so it makes perfect sense for people who have accumulated wealth in the digital world to acquire digital art." Shapiro says the pandemic "has accelerated the mind shift," fueling the passion for digital content. He believes it is "one of the trends driving the uptick," and calls it an extension of the passion for collectibles, which has moved from the physical world into the intangible realm.

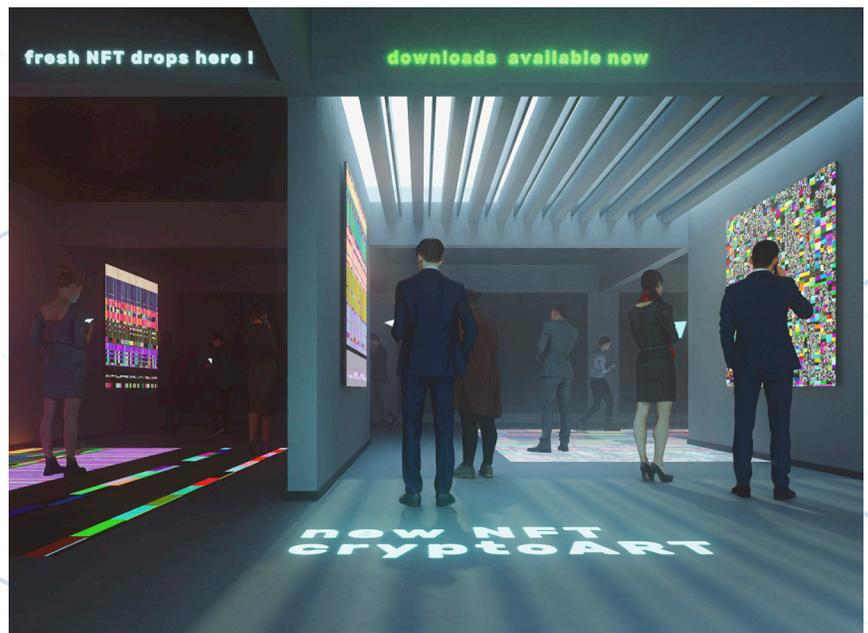
NFTs also represent a new avenue for artist payment, enabling creators and performers to receive revenue each time their creation changes hands, presumably at higher prices. Thanks to the blockchain's ability to keep track of ownership transfers (and related data), the artist can profit from each sale of the original work, whether or not it is a big hit.

"We have an entire generation that spends its life on digital devices. The next generation of art, collectibles and merchandise should be digital because that's what this generation uses," says Shapiro of Artaku, the Austin firm whose name is a play on the Japanese term for "super-fan." Shapiro sees NFT as a way to bring blockchain technology to the traditional media business. When he spent time in Asia, he recognized the importance of K-pop in Korea as manifested in fan engagement for performers such as BTS and the Japanese concept of Otaku, in which serious fans become experts.

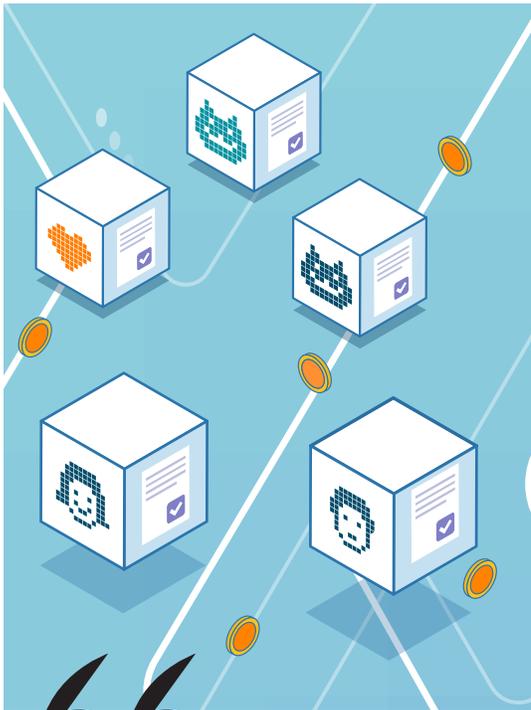


Eventually, the blockchain technology and crypto-economics will extend to the physical world."

– Raulen Chai, co-founder and CEO of IoTEx

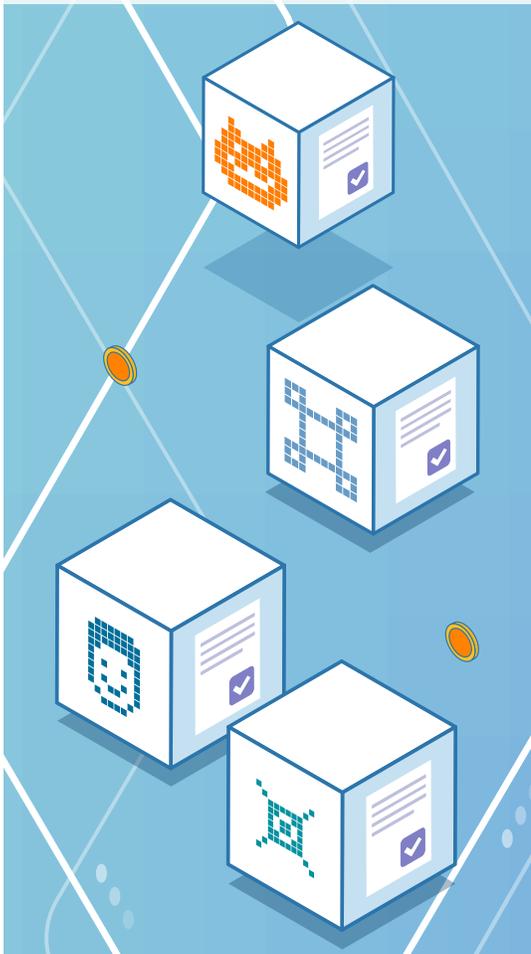


gremim/Getty



NFTs are a global game-changer.”

– Seth Shapiro, Artaku



Shapiro, who started his career as a music producer, puts an historical perspective on the value of NFTs, which allows collectors to capture a specific moment in a creative progression. NFTs, he says, “create a time capsule of digital content about how a producer lived and produced a specific work or performance.”

Shapiro contends that NFTs are the next transformation in the digital business model. When the media industry adopted Internet Protocol (IP) for production and distribution, it easily enabled consumers to make copies of copies, “which upended all business, creating a huge shift,” he says. “Bitcoin was so transformational because of its underlying basis: the idea of digital scarcity,” which was the first response to the massive IP ability of “endless reproducible copies.”

Shapiro says “NFTs are a global game-changer,” and acknowledges the category is “so transformational that we don’t have a name for it yet.” Like others, he expects that NFT is just a stake-holding term until the industry finds a better way of describing this new business.

NFT MARKET BOOM AT TOP SHOT

The National Basketball Association’s Top Shot debuted last October, offering “Moments,” virtual video trading cards formatted into a standardized cube-like layout. Within five months, Top Shot — co-developed with NFT pioneer Dapper Labs — reached more than 100,000 buyers and nearly \$250 million in sales, with most of its sales transacted in the peer-to-peer marketplace and the NBA taking a royalty on every sale.

Peter Hirshberg, chairman and co-founder of Gray Area, a San Francisco art and technology organization, relishes the arrival of NFTs — with all its challenges. He calls NFT “the 5th generation of machine-based art.”

“They are freaking out the art establishment, particularly the digital art world, he says, noting that NFTs lets artists sell directly to their collectors or stage an open edition auction without using traditional galleries. “They might generate more attention and value in a week than [a gallery] would in a year” and to a global community at lower cost. Hirshberg cites the “immutable provenance, unique work and super distribution characteristics of NFTs” as “a fundamental breakthrough” that is ushering in a new generation of artists and experimentation.”

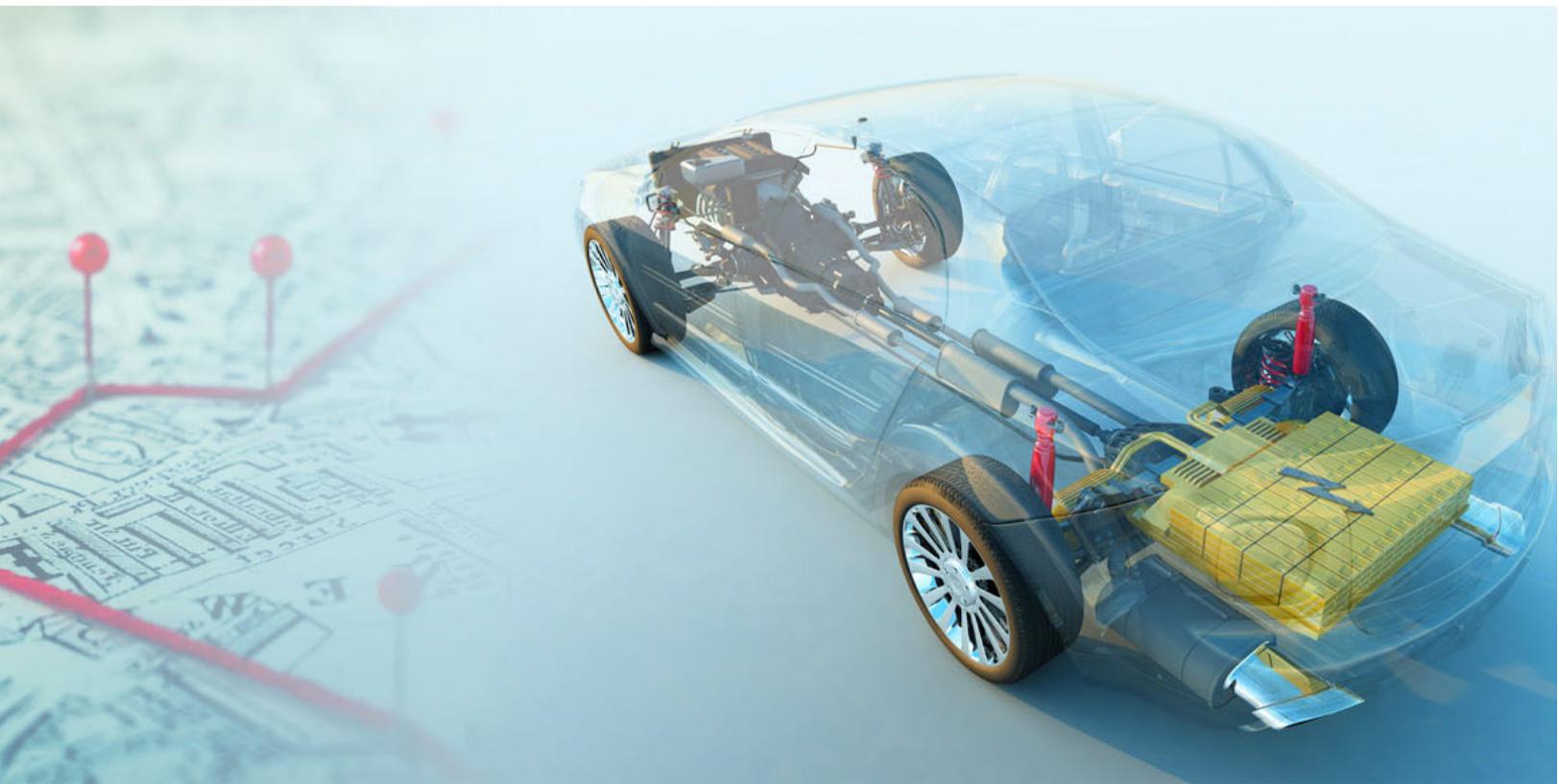
“They are busting orthodoxy,” Hirshberg adds. “What could be more perfect? Warhol’s factory meets the cloud in 2021.”

WHERE IS NFT HEADING?

“Eventually, the blockchain technology and crypto economics will extend to the physical world,” explains Raullen Chai, co-founder and CEO of IoTeX, a startup focused on building the “infrastructure and proper economics to connect the physical world with the virtual world in a verifiable way.”

Chai cites Pebble hardware that captures and signs data immediately using 16 onboard sensors, while the blockchain and smart contract can verify the signed data and can, for example, mint NFTs according to the application’s needs. He points to PebbleGo as the “world’s first decentralized location-based DApp [decentralized applications] that allows users to generate NFT cards for a specific geofence and a particular time.” IoTeX, a CTA member, debuted PebbleGo in May.

“It is the first of its kind showing how the physical world and crypto world can be connected using IoTeX’s blockchain and trusted hardware,” Chai says. He expects it will be used to create NFTs that will tokenize ownerships of droids, electric vehicles, and any smart devices that can potentially generate value.” ■



THE **ELECTRIC** FUTURE

By **Robert E. Calem**

What are some of the EV tricks that automakers are using to extend range?

As automakers transition to making only vehicles propelled by electricity and abandon the internal combustion engines (ICE) of yesteryear, consumers are experiencing range anxiety — the fear that an electric vehicle (EV) simply won't travel as far on a full battery as an ICE vehicle will on a tankful of fuel. And in many cases, they're correct. But the tide is turning.

Through engineering feats and technological advances, automakers are extracting far more range from EV drivetrains than ever before. Combined with an even greater variety of vehicles on offer, the result could be a sharp increase in consumer interest just when it's needed most.

MORE CHOICES COMING

From now to mid-decade, “the level of investment and the development of new models” that are pure battery-electric vehicles (BEVs) “is increasing significantly,” says Masaichi Hasegawa, partner in the global automotive practice of consultancy Deloitte LLP, based in Los Angeles. That's good news for consumers in the form of more choices, which is a reversal from the past decade, he adds.

Yet he notes, *Deloitte's 2021 Global Automotive Consumer Study* conducted late last year reveals limited consumer interest in BEVs along with growing interest in ICE-powered vehicles.

"Across major countries, this year for the first time," intention to buy an ICE-powered car next rose, marking "a reversal of the trend that we have been tracking for the last several years," Hasegawa says. ICE purchase intention steadily fell from 80% in Deloitte's 2018 study results to 71% in 2019 and 59% in 2020, then increased in this year's study to 74%.

The three factors restraining people from acquiring an EV are driving range, lack of charging infrastructure and price — in that order — says Ryan Robinson, lead researcher for the automotive sector at Deloitte, based in Toronto. However, 2021 begins manufacturers' concerted efforts to broaden their EV lineups to include models priced below \$50,000, which is the most that U.S. consumers want to pay for an EV, Robinson says. And as for driving range technology is now able to easily satisfy consumers' requirements, even if consumers don't know that yet.

"I don't think anybody is expecting a smooth, orderly transition from ICE technology to electro-mobility. Historically that's not how these wholesale technological changes happen," Robinson says. "There are things happening that give us a good amount of comfort that the trajectory towards electro-mobility is solidifying," but the auto industry is "still working towards a place in the performance of the technology that allows consumers not to have to compromise — and that's a big thing, that's going to be another threshold moment for getting us to the next step of the penetration of EV technologies in the market," he adds.

BEYOND BIGGER BATTERIES

EVs have been available for decades, but big leaps in driving range occurred in the last one. The original Nissan Leaf, which debuted in 2010 as a model year 2011 vehicle, traveled 73 miles on a full battery charge. Meanwhile, startup Lucid Motors' coming Air car is expected to go more than 500 miles at full capacity. Why the boost? Automakers and their suppliers credit lots of different advances.

"For EV makers the goal is to achieve 100% efficiency between the battery and the wheels to maximize range, without adding more battery to the vehicle, and 95% may not be good enough."

- SHERIF MARAKBY



"From the battery all the way to the wheels, there are many components and systems," says Sherif Marakby, executive vice president of research and development at Magna International, an automotive technology supplier based in Troy, MI. "Any percent reduction" of energy efficiency among them "takes away from that electric range and there's always tradeoffs." He says for example adding rare earth metals to an electric motor increases efficiency and range while inflating complexity and costs "but could be cheaper than adding more battery" capacity. Inverters, which move the electricity from the battery to drive the motor, can also lose or gain efficiency and range. So, for EV makers the goal is to achieve 100% efficiency between the battery and the wheels to maximize range, without adding more battery to the vehicle, and 95% may not be good enough," he declares.

But other factors such as lightweight structural materials, advanced driver assistance systems (ADAS) and a vehicle's computing architecture contribute to range extension, too, Marakby explains. In an EV, he says, weight reduction strategies can include the use of composite materials for battery trays instead of pure metal, which is a Magna specialty. Moreover, ADAS is actually a big energy user when sensing and computing is considered, so Magna offers automakers a single electronic control unit (ECU) that integrates all ADAS sensing functions in one place rather than via a distributed architecture.





Eric Bach



The Lucid Air

In March, Magna debuted EtelligentReach, an all-electric all-wheel-drive powertrain that incorporates hardware and software innovations for increased range as well as better driving dynamics. Among the hardware updates are a silicon carbide inverter with greater power density and a new “decoupling” function called Decoupling+ that engages or disengages a separate e-drive motor for the front wheels, resulting in a higher load and greater operating efficiency for the remaining rear-drive motor. Decoupling+ is a world’s first development for EVs that is expected to be on the market in mid-2022.

EtelligentReach’s new inverter and combination of front and rear e-drive systems together with improved operating software will contribute to a 20% increase in electric driving range compared with a typical EV on the road today, Magna says. Besides supplying automakers with technology, Magna also builds entire vehicles. It is the contract manufacturer for Fisker Automotive’s forthcoming Ocean BEV SUV.

For all cars, the measure of efficiency is described as miles traveled per energy consumed. There are four key contributors to efficiency loss or gain, says Eric Bach, senior vice president of product and chief engineer at Lucid, based in Newark, CA. Those are aerodynamics, rolling resistance and other elements of friction, the vehicle’s powertrain, and consumption by all auxiliary units that the vehicle needs to run — and optimizing all of them extracts more range out of an energy unit. The **Lucid Air** touts a 113 Kilowatt-hour (kWh) battery pack, which Bach believes to be the largest in any electric car, “but that’s not necessarily what

“If everybody reduces the amount of energy needed for traveling further distances, the planet wins after all.”

- ERIC BACH

makes our car efficient,” he says. Sizing up the battery is merely equivalent to having a larger gasoline tank. “Then, efficiency kicks in and takes you to the total available range.” He says, “We have designed the Lucid Air with all of these areas of efficiency in mind.”

In terms of aerodynamics, the Air’s styling achieves a drag co-efficient (CD) of 0.21, which is better than the 0.23 CD of the Tesla Model S, Bach says. Yet, because Lucid’s mission is to “inspire the adoption of sustainable transportation,” the company welcomes competition and “wants to inspire others to think about the same topics, because then if everybody reduces the amount of energy needed for traveling further distances, the planet wins after all,” he says.

Tires are a major source of friction between the vehicle and the road surface, and the science that goes in to optimizing them for rolling resistance, vehicle dynamics and safety is often under-estimated by people, Bach says. Other friction losses can occur through electromagnetic fields, and to counter this Lucid has developed an electric motor with specially placed permanent magnets, he explains.

Also in Lucid’s powertrain, the company’s proprietary battery pack is engineered to minimize energy lost to heat, letting more flow to the vehicle’s inverter and motor system, which itself is ultra-compact and efficient. The result, Bach says, is the addition of tens more horsepower without additional energy consumption.

It all boils down to “a complexity of interactions” and “you trade off all of them for a system level goal, a system level approach, and that’s how we’ve done it,” Bach asserts.

With an EV versus an ICE vehicle, the economics of energy shifts to the automaker from the consumer, as the biggest cost driver for the vehicle becomes its battery and consumers don’t absorb the expense of filling a gas tank, proclaims Matthew Renna, vice president of e-mobility and innovation at Volkswagen of America, based in Herndon, VA. Further, the upfront cost of that battery is considerably high, Renna says. Thus, for automakers, the calculations around making an EV “changes from dollars of material cost per miles per gallon into dollars of material cost per miles of range. It puts a huge amount of emphasis on range efficiency and ups the value to the [automaker] for that efficiency,” he says.

In that context, Renna adds, there are three main avenues to extracting maximum range from an EV: the battery technology, the drive units — including motors, gearboxes, inverters and cooling systems — and the in-cabin HVAC systems. Regarding the last, he notes that EVs don't have engines that generate heat to warm a vehicle's interior, so there's a greater emphasis needed on energy efficient climate controls as well as how climate is managed within the cabin, using components such as "isolation layers" and glass.

But, without taking "a firm stance in one direction or the other," Renna points out, "there's a broad debate around whether electric vehicles will continue to increase in range — in other words, keep large batteries in cars and push the limits of actual range — or do we take the other stance, which is keep the range and use the efficiency improvements to reduce costs and therefore price to customers." VW and other automakers have built modularity into battery packs to give flexibility to do both, he says.

VW's new **ID.4** BEV SUV arrived at dealerships in March. It offers an EPA-estimated range of 250 miles on a full charge, the automaker says.

When the original Nissan Leaf came to market over 10 years ago, the top priority was battery safety, so the automaker was conservative on capacity and kept range to below 100 miles, says Jonathan Ratliff, senior manager for zero emissions development at Nissan North America in Farmington Hills, MI. Then the energy density of available batteries increased,



boosting range. Now, Ratliff says, customer expectations are rising. And because motors are both capable and lightweight, he adds, vehicle aerodynamics has become an increasingly important factor in EV design. In fact, he says, aerodynamics and associated friction from wind resistance accounts for 65% of energy consumption at highway speeds.

"Every little piece of energy in an EV is precious," says Jerome Gregeois, senior manager for powertrain and electrification at the Hyundai Kia America Technical Center in Chino Hills, CA. "Anything you can save brings you a few miles."

Hyundai's **2022 Ioniq 5** BEV SUV coming to the U.S. this fall will have an AWD powertrain with a disconnection system for the front wheels motor (akin to Magna's EtelligentReach). When disengaged when not needed, it will yield perhaps a 4% range gain, or 12 miles on every 300 miles of base range capacity, Gregeois says. "If you have three or four of those" efficiency gains through innovations, he posits, soon enough "you get close to fifty miles of range, which is putting you almost in a different bracket."

The Ioniq 5 vehicle also will have a solar panel roof that provides a little over 200 watt of power and can add power to the vehicle's main battery. It is expected to add at least 1000 miles of range per year in sunny climates, Gregeois says.

In the future, there'll be a compromise to figure out between range and charging speed, and "we'll have to see what the market likes the best," Gregeois concludes. "What we'll observe in the next few years is where will the consumer settle and be satisfied." ■

Hyundai's 2022 Ioniq 5 BEV SUV



POLICY NEWS

The U.S. Chip Shortage

How COVID-19 highlighted a long-term concern

Who knew how far-reaching the impact of COVID-19 would be? The effects on travel and hospitality were obvious, but many did not predict that basic computing technology spending would intensify. Most importantly, who knew that these changes would wreak havoc with the global supply chain?

Consumer spending behaviors fueled by remote work, virtual education and entertain-at-home trends are having unpredictable consequences. Manufacturers of automobiles and certain recreational products expect fewer orders and reduced sales forecasts. Unfortunately, this has had major downstream implications on global supply chains.

As 2020 unfolded and consumer spending patterns solidified, manufacturers attempted to circle back to pre-COVID inventory levels, but supply chains couldn't respond quickly enough. This was especially true in the case of semiconductor chips.

The pandemic brought the U.S. technology sector's reliance on offshore chip production, and the need to grow domestic chip production to meet demand, front and center.

A Chip Shortage in the Automobile Sector

When COVID hit, according to World Semiconductor Trade Statistics data, automobile original equipment manufacturers (OEMs) reduced orders by over 30% year-over-year in April and May 2020.

This reduction created ripple effects. Notably, production capacity at chip fabrication facilities (fabs) were scooped up by companies building technology supporting the thriving stay-at-home economy during the pandemic.

Meanwhile, automobile OEMs were preparing for a slowdown, but events unfolded unpredictably. Spending rebounded in the second half of 2020 and auto sales climbed ahead of forecasts.

Accordingly, OEMs re-engaged their channels, attempting to shore up inventory levels, but were unsuccessful. Because of this, vehicle production slowed or stopped. Long lead times for new orders (14 to 26 weeks for delivery) and the lack of available chips, sub-components and capacity at contractor fabs were major contributing reasons. For example, GM shuttered plants in Kansas, which manufactures the Cadillac XT4 and Chevrolet Malibu, and Ingersoll, Ontario, which makes the Chevrolet Equinox.

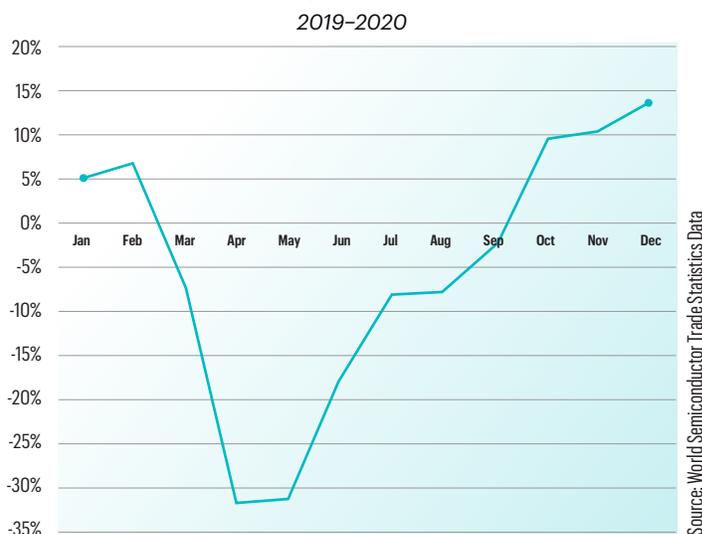
And in February, Ford cut production of the F-150 pickup truck. All told, market research firm, Strategy Analytics, expects 2021 global vehicle production output to decline by 2.2 million units because of the chip shortage, with a loss of \$7.5 billion of system demand across all electronic vehicle systems.

U.S. Losing Wafer Production Market Share

The automobile industry highlights the critical dependence electrical systems and technology products have on semiconductor chips.

The global market for the semiconductor industry is escalating rapidly. It is currently projected to reach \$469 billion in 2021, increasing 8.4% from 2020. Despite its enormous market size,

Year-Over-Year Monthly Sales Growth Percent Change in Automotive ICs



NatalyaBurova/Getty

CTA research forecasts U.S. consumer technology hardware shipments will reach 1.2 billion units and generate \$264 billion in wholesale revenue by 2024.

the reported automobile chip shortage highlights another and more profound concern, the U.S. reliance on offshore chip manufacturers for supply.

The U.S. is a leader in semiconductor innovation in several categories, accounting for 47% of the global sales market share and 65% of the global fabless market according to the Semiconductor Industry Association (SIA). However, when it comes to manufacturing capacity, the U.S. is losing its edge, with a 12.5% share of global production in 2019 forecasted to drop to 10% by the end of 2030. This is a deepening concern for national security, particularly if chip shortages stymie the advancement of new U.S. technological innovations.

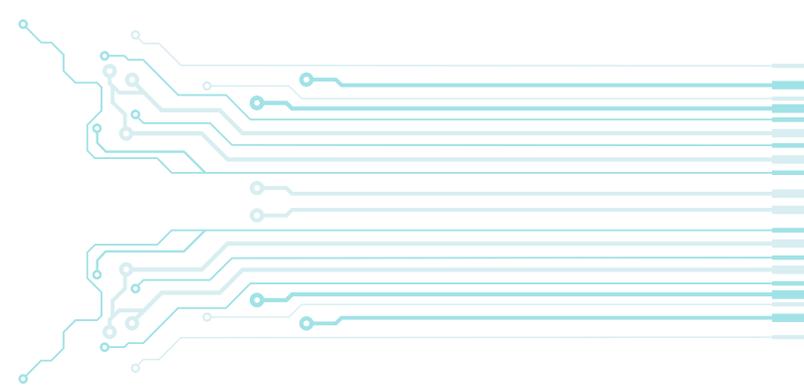
Innovations Driving Chip Demand

Over the past decade, the U.S. has been at the forefront of technological innovations such as the Internet of Things (IoT), artificial intelligence (AI), and “smart” consumer technology products. Other sectors and technologies driving demand include:

- **The 5G Wireless Consumer Ecosystem.** CTA Research forecasts that over a half billion 5G-enabled smartphones will ship to the U.S. over the next four years. According to the Taiwan Semiconductor Manufacturing Company (TSMC), 5G phones have 30-40% more chips than their 4G counterparts.
- **IIoT/ Industrial Automation/Industry 4.0.** The manufacturing, logistics and agriculture sectors are integrating chip-based AI, sensors, machine-to-machine communications and robotics into their processes. Juniper Research predicts the Industrial Internet of Things (IIoT) connections will grow worldwide from 17.7 billion in 2020 to 36.8 billion in 2025, largely due to demand in smart factories.
- **Automotive Evolution.** Frost & Sullivan expects U.S. electric vehicle (EV) sales to reach 6.9 million units by 2025, up from 1.4 million in 2020. With chip-based self-driving capabilities, advanced driver assistance systems (ADAS) and battery power management functions, EVs can have over 3000 chips per car.
- **Cloud Computing.** The growth in data centers alone, which are semiconductor-intensive, has spurred fierce market competition. Eight of the 15 largest semiconductor deals over the past two decades have occurred over the last two years and are attributed to gaining market penetration into data centers. NVIDIA’s pending acquisition of ARM for \$38.59 billion and AMD’s pending purchase of Xilinx are two examples.

Future Chip Capacity Supply and Demand

Semiconductor capacity (manufacturing of wafers per month) is expected to rise by 56% from the current installed base by 2030, but as of June 2020, 50% of this new capacity was not yet planned. Also, today 73% of the worldwide chip production capacity resides in eastern Asia (Taiwan, South Korea, Japan and China),

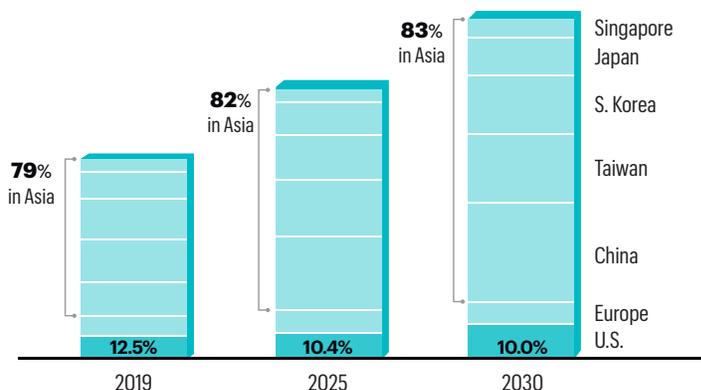


representing substantial risk to U.S. OEMs and to global chip supplies. Despite Intel’s announcement on March 23, 2021 to construct two new fabs in Arizona, as of June 2020, only 6% of new fabs “in development” were slated to reside in the U.S., leaving significant opportunity to fill the remaining unplanned gap.

However, constructing new production facilities is both costly and time consuming taking between three to five years. For example, TSMC is expected to begin construction of its Arizona plant this year at a cost of \$12 billion, but not output chips until 2024. Intel’s two fabs in Arizona are estimated to cost \$20 billion.

Asia Projected to Capture Nearly All Manufacturing Growth

2019–2030 Installed Global Wafer Capacity Projection



Source: Semiconductor Industry Association, 2020 State of the U.S. Semiconductor Industry

Short Term Impact on Tech Products

The long-term challenges associated with growing the U.S. semiconductor supply are apparent, but in the short-term, immediate demand for chips remains high. Industry experts expect shortages to last at least until the end of 2021. With new chip orders placed two to four quarters in advance and with long delivery times, meeting existing demand is a lengthy process. The implications of the chip shortage on this year’s product shipments are less certain, but it is possible that the production of gaming consoles, smartphones, and other computing products will be cut from initial levels.

At a macro-level, the pandemic highlighted weaknesses in the U.S. technology ecosystem, specifically, dependence on overseas wafer and fab companies. And in an environment where technology expansion is irrefutable, the supply of semiconductor chips must be solidified. CTA will continue to track events and the evolving market conditions to understand the implications of this critical issue. ■

CDO SPOTLIGHT

Caterpillar's Ogi Redzic: A Technology Disrupter



Since 2018, Ogi Redzic has been chief digital officer and vice president of Caterpillar Inc. with responsibility for Cat Digital. His portfolio includes managing key components of the company's digital strategy including connectivity, data, e-commerce channels, the digital platform, analytics, applications, digital marketing and lead management. Prior to joining Caterpillar, he spent 20 years working in the automotive and technology industries, most recently leading connected cars and driverless mobility at Renault-Nissan Alliance.

Caterpillar highlighted its mining offerings at CES® 2021 for the first time. A global leader in manufacturing heavy equipment for the mining industry, Caterpillar also develops the tech inside these mammoth machines. The Cat® MineStar™ technology solutions include fleets of machines, like mining trucks and underground loaders, that are delivering impressive results. Many are using this tech to work autonomously without an operator onboard. Workers are safer, machines move more efficiently, operations are more consistent and productive, equipment lasts longer and mines are more profitable. Redzic talked with *i3* about the company's digital strategy.

Q. What is Caterpillar's digital strategy?

A. We've set a clear enterprise strategy: digital is an enabler to growth for Caterpillar's entire business, not a business in itself, with a particular focus on services growth. We define services at Caterpillar as the value we provide our customers after they buy our equipment. Our digital solutions play a critical part in this by turning data into useful information for our customers, both on and off equipment. We want our customers to be more successful using our products and services than our competitors'. We're innovating not for innovation's sake but to deliver the best outcomes for our customers, dealers and Caterpillar. And we're succeeding in that goal...our digital solutions provide value at every stage of the relationship — purchase, own and support. Our strategy grounds us and keeps us focused on what is really going to make a difference in the lives of our customers.

Q. What are some of your biggest accomplishments?

A. We met our target of connecting one million assets. We've made it much easier to do business with Caterpillar and its dealers online. We have streamlined and moved our data infrastructure to cloud and have built a number of common services to accelerate new application development. We've pushed the limits of machine learning to help customers predict issues before they occur. But none of this could have happened without the right people. I'm most proud of building our impressive digital team with a strong tech culture. Over the past few years, we've hired

hundreds of digital and tech experts to tackle many complex challenges in the industries we serve and retained critical, existing talent that understood our physical product and our business well. Only when successfully combining new digital skills and existing core product experience could we make big leaps forward. I believe we've found the right balance.

Q. How does digital innovation support Caterpillar's growth strategy?

A. We always have a pulse on what is important to our customers and want to create digital solutions to make their lives easier and improve their business. They care about keeping their machines and engines running safely and efficiently, while reducing their operating cost. Let me give you a few examples of Caterpillar products that support this. Caterpillar's condition monitoring solution uses predictive analytics that enable proactive scheduling

“Customers report they've seen a step change in safety when we introduce automation.”

-Ogi Redzic



of maintenance, extend maintenance intervals on equipment and reduce maintenance costs. With our mining autonomy offering, haul trucks can navigate on their own with little to no human assistance, improving safety, reducing variability and increasing productivity. Our suite of fleet management tools gives customers a full view of their fleet at the tip of

their fingers, including tracking equipment location and hours, monitoring machine use and health, and taking action to keep their operations running. Online channels like Parts.Cat.com help customers find and order parts. And for some of our bigger customers, we



fully integrate their operational tools, making it easier to keep their fleets at top performance levels. This is an indicator that we're going in the right direction of where our customers need us digitally.

Q. How has Caterpillar's autonomous technology improved safety and increased productivity for customers?

A. Autonomous mining is more than simply unmanned machines; it's a system of machines, technologies, communication networks, safety systems and software working together seamlessly. The mining industry is very safety-conscious, and customers report they've seen a step change in safety when we introduce automation. Mine sites can be located in the most rugged and extreme conditions and run 24/7. Removing operators from the trucks reduces opportunity for injury. To date, there have been zero lost-time injuries related to autonomy. Additionally, some customers have experienced up to 30% improvement in productivity with our autonomous solutions. Autonomy is about automating every movement, pulling out waste, making it more repeatable, like a factory. Autonomy provides 100% process conformance, resulting in increases in productivity.

Q. How does Caterpillar differentiate itself from its competitors in the tech industry?

A. Everybody knows Cat iron. But now, we are being recognized for our intelligent,

connected iron. Our brand is a differentiator in itself, but now our challenge is to establish Caterpillar as a digital leader — and we're making that happen. Nobody knows Caterpillar products like we do — we design them, build them, maintain them, improve them — which means no one can make better digital solutions to help our customers. You always think of disruption as an external force, but when we can harness the power of our domain expertise and couple it with technology, Caterpillar becomes the technology disrupter in our space. We believe we are setting the industry pace for innovation. Our world class customer experience leverages the latest technology and the strength of our global dealer network, 161 independent dealers serving 192 countries. We have decades of experience designing, manufacturing, servicing and innovating. We have the ability to pool all that knowledge to provide customers with the best solution at the best time, which is a tremendous advantage. More than any of our competitors, we work with our dealer network on new digital solutions. Being able to leverage this network gives us the upper hand, because when we can work with those selling and servicing our equipment day in and day out, it helps us create extremely impactful solutions.

Q. What types of opportunities are available at Caterpillar for tech professionals?

A. Instead of talking about specific opportunities, I'd love to speak about the

interesting work our people are doing. Caterpillar digital teams offer a unique opportunity for tech talent to grow their careers using the latest technology to do work that really matters. If you're all about cloud, at scale services, data storage and processing, we have a place for you. If your background is communications and your interests lie in 4G, 5G or satellite, we have a place for you. Or maybe you're all about the user experience, creating the way customers should engage with a company and its products. We have a place for you, too. And this only continues to grow. Machine learning, AI — we have some fun challenges for you to solve. These are important areas for our customers and the interest in the industry is growing. Caterpillar wants people who want to stretch their skills to make a big difference — to keep mission-critical equipment working their best in the hottest and coldest places on earth.

Q. What does the digital future look like for Caterpillar?

A. This space is moving very fast, so the future is hard to predict. Caterpillar has always been synonymous with the best iron in the world and we are now also making the most intelligent iron in the world. What really matters is that we are well prepared for whatever comes next because we have built this strong digital muscle for Caterpillar. Bring the future on! ■

POLICY FORECAST

A Look Ahead

Washington DC is in a state of change

We have a new President, new regulators, a new Congress and new policymakers on our key committees. We are still reeling from a mob attack on the Capitol and our democratic process.

Our nation is also undergoing change. As we emerge from COVID we are struggling to find normal footing. We are trying to imagine what life will be like — in our offices, stores, schools and homes — in the wake of the pandemic

But no matter what else changes, CTA's core principles stay the same:

- We believe America's global technology leadership is critically important and must be maintained.
- We do not seek government funding for our industry.
- We support balanced budgets, high-skill immigration, and free and fair trade.
- We believe innovation is *the* solution to climate change, health care, food production and other key challenges facing our nation and our world.

Policy Priorities

This year we will be working hard to educate Congress and the Biden Administration about our industry and our values.

We will be urging that Congress allocate additional spectrum for consumer use and remove obstacles and regulations that are slowing the rollout of wireless broadband infrastructure. As we look at some of the most pressing challenges like creating jobs, improving education and increasing

access to health care — broadband is the key underlying technology.

We will be advocating a commitment to free and fair trade. The Biden administration can start with the removal of China tariffs that act as massive taxes on U.S. companies. We also will be pushing the administration to reestablish U.S. leadership through bilateral and multilateral trade agreements, and work with our Democratic free-market allies to disincentivize China's bad behavior.

We will be pushing the government to maintain leadership on key technologies of the future like robotics, artificial intelligence and quantum computing. Leadership in these technologies will soon determine a nation's economic and military strength. We need smart regulatory approaches to these technologies, not top-down mandates that would smother innovation.

We will be pushing back on government attacks on our crown-jewel companies. While we do not believe that big (or small companies) are inherently good or bad, we know that attacking our own national champion companies is a short-sighted and destructive policy that only benefits China and other economic competitors.

Finally, we will be encouraging Congress to leave partisan bickering behind and

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We will be pushing the government to maintain leadership on key technologies of the future like robotics, artificial intelligence and quantum computing.
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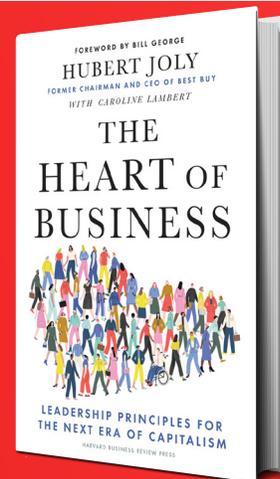
address the real concerns of the American people. We are active participants in groups like No Labels and the Commonsense Caucus that encourage policymakers to reach across partisan lines and find practical solutions to our nation's challenges.

The technology industry is a key American asset. Over the past year CTA member companies showed their value as they allowed Americans to work, educate our children, be entertained, stock our kitchens, connect with loved ones, and access medical care — all without leaving the safety of our homes.

We look forward to working in Washington and the state capitols to enable even more ground-breaking innovation in the years to come. ■

BOOK REVIEW

Hubert Joly's "The Heart of Business"



Former Best Buy CEO Hubert Joly used to call me to discuss industry strategy on policy issues – including trade, tariffs and taxes. I enjoyed those calls as frequently they would stray into discussions on the human condition, philosophy and what makes people tick. I was sorry to see him leave Best Buy, but thrilled he filled his position with the incredibly smart and competent Corie Barry. Now, he has written a compelling book which may open the eyes of those focused on a more traditional business approach.

This is not just another business book. It includes research bolstering why engaged employees, a diverse workforce and a mission are more important than focusing only on revenue and profitability.

Before I got to know him, I thought Joly was just another hot shot turnaround specialist. When he joined Best Buy in September 2012, the company was limping downhill. Its share price languished around \$17, key financial indicators were going south, and the stores had lackluster customer service. A failing company's board of directors typically hires an outsider CEO to make tough decisions and cut staff because an outsider does not have working relationships with them. When Best Buy's board hired a French CEO, Hubert Joly, from outside the tech world (he headed travel business Carson), I assumed it was to close stores, cut employees and increase profits.

But instead of closing stores and firing people, Joly took a different approach — one he describes in his fascinating new book, "The Heart of Business." Joly's personal and business journey transitioned from prioritizing numbers and

results to leading with a more human first approach.

This is not just another business book. It describes a personal journey — the transformation of Joly, Best Buy and the business community from a shareholder value model to a larger model focusing on empowerment and societal change. It includes research bolstering why engaged employees, a diverse workforce and a mission are more important than focusing only on revenue and profitability.

We learn about Best Buy's strategic changes, but the main message is Joly's belief that every business needs a noble purpose to inspire employees.

Joly writes how each employee is an individual with hopes, dreams and aspirations. He describes expanding Best Buy's health care benefits policy to include transgender needs based on listening to the concerns of one employee. He talks about the importance of creating trust and a team

environment necessary for success. He also changed performance evaluations to focus on human metrics first, followed by business metrics such as customer satisfaction and lastly, financial performance.

Joly describes five key ingredients to shift to an employee-focused environment:

- **Connecting** the individual's search for meaning with the companies noble purpose;
- **Developing** authentic human connections;
- **Fostering** autonomy;
- **Growing** mastery; and
- **Nurturing** a growth environment.

Each gets a chapter and Joly easily weaves in examples, stories, research and results to make his case that motivation comes from purpose and relationships.

By the end of his tenure at Best Buy, Joly had pushed the frontiers of business leadership rooted in ethical principles that transcend standard financial metrics to motivate, engage and excite employees. This book will give every leader practical takeaways useful for motivating people, developing teams and dealing with human challenges. ■



The Future of Work is Hybrid

In 2020, companies nationwide shifted to remote work at the drop of a hat.

For the most part, this work transition has been a surprising success. Despite countless distractions from children and the general drain of living through a pandemic, workers — who had the ability to work from home — were generally more productive, enjoyed greater flexibility and by December 2020 even reported being happier than the same time in 2019.

As employees return to the office, they want to continue to enjoy a flexible work environment. According to CTA's Annual *Future of Work Study*, 89% of tech executives say flexible work arrangements are the most important employee benefit and 65% say they'll hire more employees to work remotely.

During the pandemic, companies defaulted to a remote-first approach. As employees start to return to the office, organizations must be intentional in helping employees understand where and how work happens. If your organization is planning a hybrid approach to give employees the flexibility of working from home and coming into the office certain days of the week, there are some considerations to create a successful work environment.

Prioritize Asynchronous Communication and Digital Platforms

There are a host of technology platforms for asynchronous communication and collaboration to maintain a remote-first approach. CEO of Klaxoon Matthieu Beucher, explains, "When we're all remote, we know everything is remote-first. If some people are in the office and some aren't, processes can become muddled and hurt productivity. As the adoption of

The office may still be used for brainstorming, onboarding, relationship building and sensitive conversations.



hybrid work becomes widespread, tools like Klaxoon will level the playing field so teamwork can thrive while still allowing anyone to contribute from where they do their best work." Another example would be to set the precedent for meetings that if one attendee is remote, then all attendees join via a platform rather than having some employees in a conference room and some attendees join on a screen which can hinder communication.

Leadership sets the Example

When the CEO and management is always in the office, they're setting the expectation that's where the action is — and it becomes the center of gravity. Encourage a culture that does not resort

back to the presenteeism trap of the employees that show up in person are viewed as the most productive. In a survey of 10,000 employees by the Becker Friedman Institute for Economics at the University of Chicago, more than 80% reported being just as, if not more efficient working from home. The pandemic remote work period forced us to focus on outcomes and results, not time logged on email, and that culture needs to continue for a successful hybrid environment.

Rethink the Physical Office

With employees that can work from home a few days a week, the reasons that employees will come into the office will change. The office may still be used for brainstorming, onboarding, relationship building and sensitive conversations. Nicholas Bloom, Stanford University Professor of Economics, even suggests having employees come to the workplace on the same two to three days for collaboration. Home time can be for deep work and other asynchronous tasks that workers find to be more productive when done from home.

Although many companies have announced that they will eventually return to work with a hybrid approach, creating a successful hybrid work environment takes time and intentionality to be successful. ■

POLICY OUTLOOK

The Future is Here... Self-Driving Vehicles

Deployment of self-driving vehicles (SDVs) is creating a compelling future.

Automated driving systems will make American roadways substantially safer and increase mobility for seniors, rural communities and those with disabilities. Self-driving vehicle technologies will increase efficiency and productivity, reduce time spent in traffic, boost the economy, and create millions of jobs.

Americans want the advantages of SDV technology. CTA® research shows that American consumers want safety improvements, better mobility and less time spent in traffic. Sixty percent of consumers are interested in replacing their car with a self-driving vehicle. Entrepreneurs, technologists and innovators are working to realize these benefits by creating new business models and use cases, testing and safely deploying self-driving technologies.

Safety First: Fatality-Free Roads

Innovation is about changing people's lives for the better. Self-driving vehicle technology will save thousands of American lives every year and millions globally. The vast majority (94%) of vehicle related fatalities and traffic accidents are attributable to human error. SDVs drastically reduce risks associated with both distracted and impaired driving, keeping our communities and loved ones safer. Enabling this technology to come to fruition will ensure safer and more sophisticated transportation options that save lives and protect America's roadways.

Empowering Communities

Many of us take for granted our ability to travel freely and easily using personal

vehicles. But for seniors and individuals with disabilities, mobility is a significant obstacle. SDVs promise to give these communities a new and transformative level of independence. More, for those in rural areas, SDVs provide mobility options for people that cannot access traditional public transit.

Economic Impact and Global Competitiveness

Automated transportation is vital to U.S. economic success. China is focusing on autonomous transportation as part of its high-tech infrastructure program, while the European Union and other nations are moving forward as well. The nation that wins this race will claim the high-skill jobs that SDVs will require, from the manufacturing of advanced sensors to the development of new artificial intelligence technologies. The U.S. has been a pioneer in the self-driving vehicle space and the right policies are important to maintain this competitive advantage.

Policy Landscape

Capturing the benefits of self-driving technology requires thoughtful collaboration between the public and private sector. As SDV technologies evolve, public policy must keep pace and adapt, with flexibility towards the future. One challenge facing autonomous transportation innovators is the growing patchwork of legislation and regulation across the U.S. Conflicting local rules delay self-driving vehicle testing and could ultimately hinder America's global leadership. A federal regulatory framework that removes barriers and expedites rulemaking is essential to the advancement of autonomous technology. Opening the



roads for testing will help to further develop the technology and make these vehicles safer.

Updating existing standards is essential to the rollout of this technology. The current Federal Motor Vehicle Safety Standards (FMVSS) were established when the driving task was assumed to be performed by a human, which limits and sometimes prevents the ability of self-driving innovators to make significant changes to vehicle design. Temporary exemptions can provide interim relief but are not a viable long-term solution. The National Highway Traffic Safety Administration needs to revise outdated standards before SDVs can be widely deployed.

Innovation can be embraced while simultaneously protecting public safety. In fact, both are essential. Updating and modernizing laws and rules is vital to realizing the beneficial uses of SDVs. Congress should pass a self-driving bill to enable broader testing and deploy automated technologies. A “technology neutral” approach is also critical to allow new innovators to enter the SDV space, develop safer technologies and provide greater efficiencies.

Self-driving vehicles are already making an impact, but — with close cooperation between government and the private sector — we are just at the beginning of an incredible road to innovation and improving lives. ■



FACES OF INNOVATION

Justin Barad, CEO and Co-founder, OSSO VR: Gaming Meets Medicine

This virtual reality platform allows surgeons to practice procedures in a safe and repeatable environment before entering the operating room.



How can surgeons get real world surgical experience without the risk of injuring a patient? Enter Osso VR, an innovative technology developed by Justin Barad, MD, CEO and co-founder of Osso VR. The UCLA and Harvard trained orthopedic surgeon took his love of gaming to address the ongoing surgical skills gap. “Since middle school and high school, I have loved the gaming realm,” said Barad. “In dealing with a family member with autoimmune challenges, I wanted to develop software and technology to help people. Technology and advances are happening at lightning speed and emerging medical technologies can be more complicated than surgical techniques from the past. Bottomline, doctors need to keep practicing to stay current.”

Osso VR is a clinically validated surgical training platform designed for medical device companies, practicing surgeons, residents and medical students of all skill levels. Using immersive VR technology, the scalable platform offers a realistic, hands-on training environment that leads to real-world performance improvements and ultimately improved patient outcomes. Although numbers vary between studies, generally a surgeon needs to perform surgeries, under supervision, for 75 to 80 patients before being deemed “trained as safe” for the

procedure. Surgeons work in supervised teams, although not every surgery involves the same medical personnel. According to Barad, on average, there are up to eight people in an operating room at a time, yet often the focus is only on training the surgeon, often excluding the other critical members of the team.

Training Delays

When the COVID-19 pandemic began, the American College of Surgeons stated that many states issued postponements on “non-essential” surgeries that led to a

backlog of postponed procedures. The surgical backlogs are only recently starting to resolve. This has created a chain reaction of delaying hands-on training for trainees and surgical teams in practice that will likely have a long-standing effect on the supply and quality of available health care personnel.

As the first training platform to incorporate assessments into its modules, Osso VR measures the surgical trainee’s knowledge, accuracy and overall efficiency of a procedure. A recent University of Illinois College of Medicine at Chicago study published in August 2020 examined whether VR surgical training would show an improvement when compared with traditional training in procedural accuracy and completion rates for a procedure. Its conclusion found that using Osso VR more than tripled the odds of completing a procedure successfully (25% to 78%). This demonstrates that VR has the potential to significantly improve surgical performance for health care professionals across the board, which should lead to better outcomes for patients. Another study performed at UCLA and published in the *Journal of Surgical Education*, Osso VR showed an average of 230% improvement in surgical performance.

Osso VR’s award-winning team of clinical, medical device and illustration experts are from leading institutions including Apple, Electronic Arts, Industrial Light & Magic, Medtronic, Microsoft and Sony. Osso VR’s exceptional level of visual fidelity surrounds every aspect, from anatomical detail to the OR environment, creating a virtual operating room that allows for collaborative training for the surgical team. “We can give surgeons in our network another tool to continue to push the limits of what’s possible when it comes to providing value for their patients,” stated Barad. To learn more, visit ossovvr.com. ■

Oscars or Emmys?

COVID-era releases blur awards legacy



Streaming video has accelerated the melding of the TV and movie worlds.

During the opening banter at the Golden Globes awards telecast, hosts Tina Fey and Amy Poehler tried to explain the changing media landscape. They emphasized the Hollywood Foreign Press Association’s annual recognition goes to both movies and television shows, and as Poehler confessed, “It’s hard to tell them apart this year.” Fey noted that, “We watch TV and movies differently,” offering jocular examples of production techniques that traditionally distinguished TV shows from feature films.

Their dialogue revived a question that has simmered in Hollywood for a decade. Why are there still separate Academies and awards for TV and movies? The Golden Globes (bestowed by producers, actors, writers and critics) recognize both distribution systems: theaters and home electronics. Understandably, there are huge historic and economic reasons to separate Academy of Motion Picture Arts & Sciences “Film” and Television Academy “TV” awards — even though the two sectors are intertwined at studio, technology and many other levels. And increasingly in viewers’ perceptions.

Some believe that since top talent [performers, directors and writers] are working in both spaces, it could force a merger of the organizations. As the studios expand their direct-to-consumer strategies, they won’t care about the awards like when they needed buzz to sell DVDs. Economically and aesthetically, TV shows and films have long differed, but those distinctions are merging.

Meanwhile, the style of film and television has evolved. The writing and production of TV shows was driven by characters and the continuing story arc

was sustained for multiple episodes, while a motion picture was a single-standalone story. The popularity of film “franchises” (think “Avengers”) means annual updates of stories with familiar characters and situations. At the same time, streaming video series look like long movies. For example, Netflix’ popular “Unorthodox” (four episodes totaling 3.5 hours) was not much longer than “The Irishman.”

These projects are fomenting a new vision of the “viewing time” commitment by binge or otherwise.

Follow the Money Flow

The revenue and pricing structure has also changed. Broadcast and cable channels were ad-supported, while customers bought tickets to see a movie. Streaming services offer a new mix of revenue systems.

Streaming video has accelerated the melding of the TV and movie worlds, and pandemic-induced restrictions have sent feature films directly to home screens. Although the prestige of an Oscar historically outshone an Emmy award, it’s not clear the audience distinction will persist. More, it’s uncertain if the award programs will return to their earlier glory.

With fragmented audiences, ratings of the awards telecasts have been dropping precipitously. The bragging rights for producers and performers may soon disappear for such awards — further complicating the economic equation.

This year’s Oscars emphasized the theatrical/home video convergence. Thanks to the pandemic, most of the 2020-early 2021 Hollywood output intended for theatrical debuts showed up first on home screens. As a result, the streaming companies (which would have released some of their original programs theatrically) wound up as leaders of the pack for Oscar nominations: Netflix snagged 35 nominations, Amazon Studios had its most-ever at 12 nominations and Disney+ and Apple each earned their first nominations.

Some new productions will continue to bend the distinctions between film and TV shows, notably limited series such as “Wandavision” on Disney+. Meanwhile, movie stars have become video headliners. For example, Natalie Portman and Lupita Nyong’o will star in the new Apple TV+ “Lady in the Lake” mini-series — the first major TV project for both Oscar-winning actresses.

And to underscore the Awards blur: when the 73rd Emmy Awards are telecast on September 19, 2021, they will appear on both the CBS-TV broadcast network and on its corporate cousin, the Paramount Plus streaming service. ■

FORWARD STRATEGIES

Make Your Company Stand Out

Affordable promotional strategies can differentiate your company

Consumers are exposed to thousands of marketing messages every day so companies (especially in spaces dominated by commoditized goods) must quickly grab shoppers' attention. Luckily, as noted in the recent book *Think Like a Futurist*, there are clever and cost-effective ways to differentiate your company from competitors. Even simple shifts in packaging or presentation can help you stand out.

Create a Memorable Marketing Message

Setting yourself apart from competitors starts with effective brand positioning to convey your company's value proposition and key points of differentiation. A few simple rules can help you package your solutions including:

- Your value proposition should be summarized in two sentences, and stated in 10 seconds — half as long as an “elevator pitch.”
- Promote one to three unique sales points and communicate them across all creative mediums.
- Charts, infographics, videos and other graphical elements should quickly convey complex concepts.
- Focus on telling a larger story that underscores your company's mission, values, background, personality and shows its positive impact to consumers.

Distance yourself from competitors by positioning. For instance, you might style your company as a leader that:

- Offers more value-minded takes on traditional category offerings.
- Specializes in more creative alternatives to solutions provided by traditional manufacturers.
- Designs its products and services to cater to marginalized audiences or niche segments.
- Places greater focus on sustainability and eco-friendliness.
- Seeks to do social good in the community and make a positive impact.
- Prioritizes more individualized solutions or personalized customer service.

Establishing yourself as unique is largely a matter of resourcefulness, not resources. Successfully setting yourself apart from competitors is primarily a matter of storytelling and presentation. It's all in how you choose to present yourself.

Build Your Advantage

Most marketing boils down to a website landing page and a handful of search engine text. To avoid being overlooked by shoppers, surprise and delight your target audience to jolt them out of passively scrolling past your offerings. Strategies that capture attention include:

- Take an authoritative or contrarian stand on a topic.
- Employ colorful or creative ways to visualize data and concepts.
- Piggyback on rising online trends or timely news topics.
- Use offbeat approaches to get your message across.
- Employ fresh mediums and artistic styles to convey key messages.
- Create outreach campaigns to spotlight your community.
- Offer one-of-a-kind or limited-edition goods.
- Partner with other brands to offer promotional crossovers.

Similarly, employing thematic approaches to marketing campaigns can make a lasting impression. These tactics can help you craft promotional strategies:

- **Urgency:** Emphasize your solutions' ability to help shoppers solve a problem.

- **Accessibility:** Add unique features (for flair or functionality), innovative control methods or capabilities, or fresh ways to interact with your offerings.
- **Performance:** Promote your unique capabilities like processing power, customer service or connectivity.
- **Creativity:** Put fresh spins on familiar concepts, take an original stance on subjects, or rethink outdated paradigms (e.g. offering touchscreen vs. keyboard controls).
- **Collaboration:** Combine forces with like-minded firms to co-design products and services, or deliver crossover promotions that appeal to both audiences.

Stay Competitive

More money, manpower, or cutting-edge solutions are not necessary to impact the marketplace — just take a new approach to how you package and present your outreach efforts. Likewise, no two businesses' strategies for setting themselves apart are the same. To be successful put yourself in your customers' shoes and identify their biggest challenges and then communicate your ability to solve their problems.

It takes time to craft a successful message and determine which promotional strategies most effectively resonate but marketing campaigns must always evolve based on ongoing feedback. The more you simplify your message, set it apart from rivals' positioning, and the faster you can communicate it, the more successful you will be. ■



ADVICE FOR ENTREPRENEURS

Businesses Ready to Blaze the Comeback Trail

We are small businesses. We love being lightning fast. Let's use that to our advantage on the back end of the pandemic. I started my first company in 2008 in our spare bedroom and leveraged the Great Recession comeback to launch it. Now, I'm dusting off my playbook and making some changes for the biggest comeback of our lives.



Pull Back on Virtual Conference Spending

Virtual conferences and programming are here permanently. Expect mixed conferences to provide more access for you and your team. However, remember that hybrid conferences may unlock a new business model for event planners to increase revenue by allowing digital attendees for a fixed cost of video access. If that happens, it will create some tension for the attendees, as our primary value is typically in-person networking. Pull back on virtual strategically, but don't back out completely.



Be First and Move Forward on In-person Spending

Events are on the books now. Move fast to get the space upfront that's been reserved for your large competitors that are moving too slow. Get in early on event sponsorships, as well. Returning title sponsors are also uncertain. Leverage that

uncertainty. By the time your customers show up at the show (six to 12 months from now), they'll say, "Wow, you guys really are moving up in the world. Right up front!"



Focus on In-Person

Make in-person 90% of your focus and leave the remaining 10% for everything else. We're hungry to do deals. We've been in our bunkers for more than a year and our attitudes have switched from "Let's talk," to "Let's go!" Get on board for as many in-person opportunities as you can get on the calendar. If they are on top of each other, that's fine. You can split your time between events and easily move from one to another, like hopping between events at CES.



Retrospectives with your Clients

I'm curious if I'm going to need to get on airplanes in 10 years for meetings. I'm sure there are going to be select trips that are critical for one-on-one client meetings. I

think there is a real possibility that trade shows and events will be in-person meetups, and that all other non-issue solving client meetings will be virtual. It's just faster, and now that we're comfortable with how to get our selfie camera angle looking good, it's going to be the same.

Plan a retrospective now on pre-pandemic, during-pandemic, and post-pandemic meeting values and outcomes. What worked? What was missed? What's the way forward for your brand, clients and vendors? Then update your company policy.



Stay Light on Your Feet

Things are going to keep changing fast, so keep your operations agile. This means paying a little more for refundable flights and hotels. Be prepared for quick changes and delays due to pandemic-lingering schedule changes. Update your company's travel budgets, policies and marketing budget and add language stressing, "This will be updating regularly." ■

TECH TACTICS

Zoom Boom

How Zoom beat established videoconferencing players

Zoom has experienced explosive growth during the pandemic. In December of 2019, Zoom had 10 million daily users. From April to June 2020, the app was downloaded nearly 300 million times — 200 million times from Google Play and 94 million times on Apple’s App Store, shattering records for the most downloaded non-game app in history.

Zoom had the highest growth in brand recognition among Americans in 2020, according to *Morning Consult’s* annual study. By March 2021, Zoom was worth as much as the top seven airlines (by 2019 revenue) combined. How could videoconferencing upstart Zoom crush established players like Skype, owned by Microsoft and Cisco’s Webex?

In 1998 I was in Nepal and needed to call North America. By telephone, it cost 300 Nepalese Rupees per minute (about \$2.50). Instead, I went to an Internet café, put on a headset, and called for 10 Rupees a minute (8.5 cents). At the time, although Voice Over Internet Protocol (VoIP) technology was not duplexed, I predicted that all long distance would be free by 2005 for consumers. Skype beat my prediction by two years launching in 2003.

In the graph below, VoIP calls don’t even register until 2005. International

long distance for telcos peaked in 2014 and then began to decline. By contrast, VoIP continued to explode. International VoIP calls are now more than 1,200 billion minutes or 1.2 trillion minutes a year. It’s important to note, disruption can be a decade or two in the making until the technology matures enough to overwhelm traditional incumbent companies. For example, in 1998 U.S. telcos made 70% of their profit from long distance calls.

Now here’s the killer stat: Zoom is providing 3.5 trillion minutes of videoconferencing a year. That is more than all international minutes from traditional telcos added to all international VoIP minutes — then doubled! And Zoom is doing it by itself.

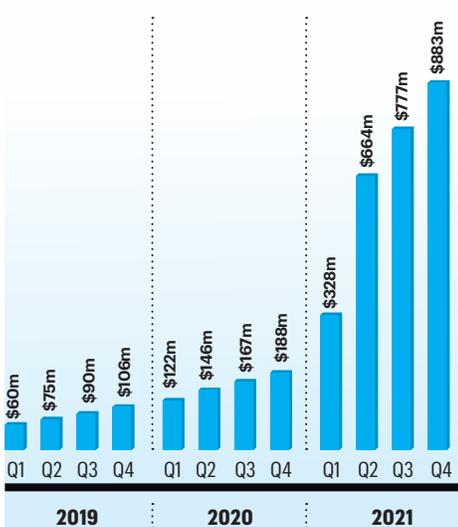
- **Freemium:** Zoom’s freemium model allows a user to host meetings of 40 minutes for up to 100 people. That allows individuals working in companies

that are locked into existing contracts with Webex or Skype for Business, to try Zoom. Zoom Founder Eric Yuan said, “Without a freemium product, you’re going to lose the opportunity to let many users test your products.”

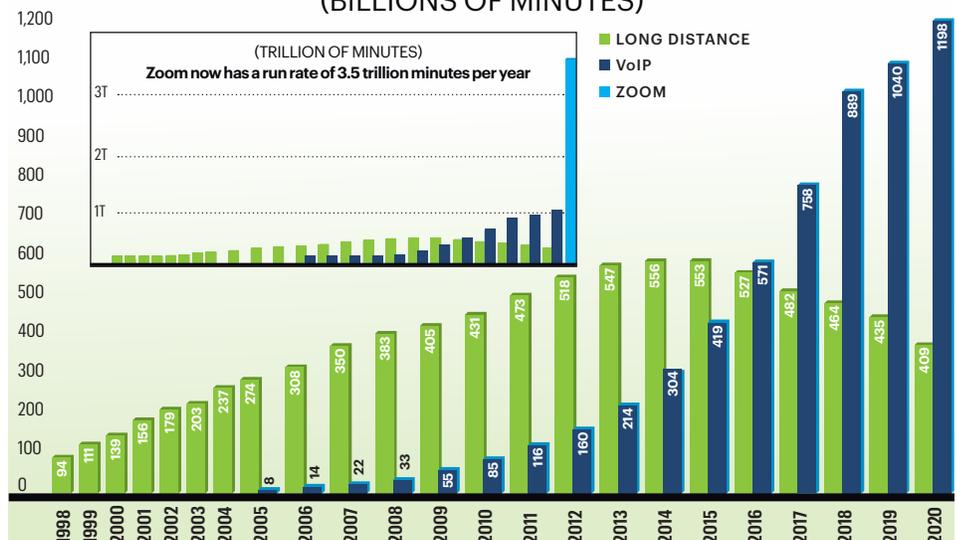
- **Price:** In 2008 at a Cisco Telepresence demo, an immersive video conferencing experience cost \$70,000 per location. In 2020, a Zoom Pro account costs \$20 a month and uses existing hardware (laptop, desktop, or smartphone). Cutting the cost of video communication to almost zero results in exploding demand.
- **Ease of Use:** Zoom has focused on creating a frictionless experience compared to other platforms, with meetings accessed by a simple link.
- **Scalability:** Zoom was designed to scale and built on AWS to serve explosive demand.
- **Implications:** Zoom’s success will accelerate the decline of landlines. The average cost of a home landline in the U.S. is \$45 per month. Users can call worldwide via Zoom for \$20 a month. However, an increase in bandwidth demands and expectations will require connected Ethernet, Wi-Fi and mobile. This, of course, will fuel consumer desire for Gigabit Ethernet, Wi-Fi 6 and 5G. Welcome to the Zoom revolution! ■

Jim Harris is the author of Blindsided.

ZOOM’S QUARTERLY REVENUE



INTERNATIONAL LONG DISTANCE VS VOIP VS ZOOM (BILLIONS OF MINUTES)



BY THE NUMBERS

Record Television Shipments in 2020

TVs remain the champion of home entertainment

It should come as no surprise that Americans watched a lot of TV in 2020, as people resorted to movies and shows to pass the time during the pandemic. And likewise, consumers upgraded and added TVs to their households *en masse*, fueling record television shipments last year. In 2020, 47.3 million TVs shipped to U.S. dealers, up 15% over 2019. It was the highest number of shipments on record.

However, the pandemic and resulting consumer behavior set off unexpected shipment trends that remain at play as the cultural impacts of the pandemic linger. For one, television revenues dropped 7% in 2020. Why, when units rose so high? It's because the television market is extremely competitive, and manufacturers had to produce high quantities at attractive price points to take advantage of surging consumer demand.

Secondly, the quarterly shipment pattern for TVs is out of line with typical annual patterns. In an ordinary year, the industry would see the bulk of its shipments in the fourth quarter, in preparation for the holiday season. However, 2020's third quarter came close to matching the fourth in terms of units

shipped, and the first quarter of 2021 had higher than average shipments when it is typically the slowest quarter.

Looking Forward

CTA's *Dynamic Forecast* predicts that second- and third-quarter shipment volumes will fall below the first as people emerge from their pandemic social distancing practices and seek entertainment outside of the home. And the fourth quarter will make up about 30% of total annual shipments — not as pronounced as a typical year but still the biggest quarter. When all is said and done, 2021 will see 41.6 million TVs shipped, which would make it one of the industry's best years again despite a double-digit (-12%) drop from 2020's high.

Television revenues will decline again in 2021, but not as drastically as units. The industry will focus on newer technologies like 8K, mini-LED and OLED, as well as larger screen sizes to add value to sets later in the year. 8K shipments will reach 1.6 million this year, introducing consumers to the next level of resolution. Mini-LEDs made a splash at CES this year as manufacturers demonstrated how this backlighting

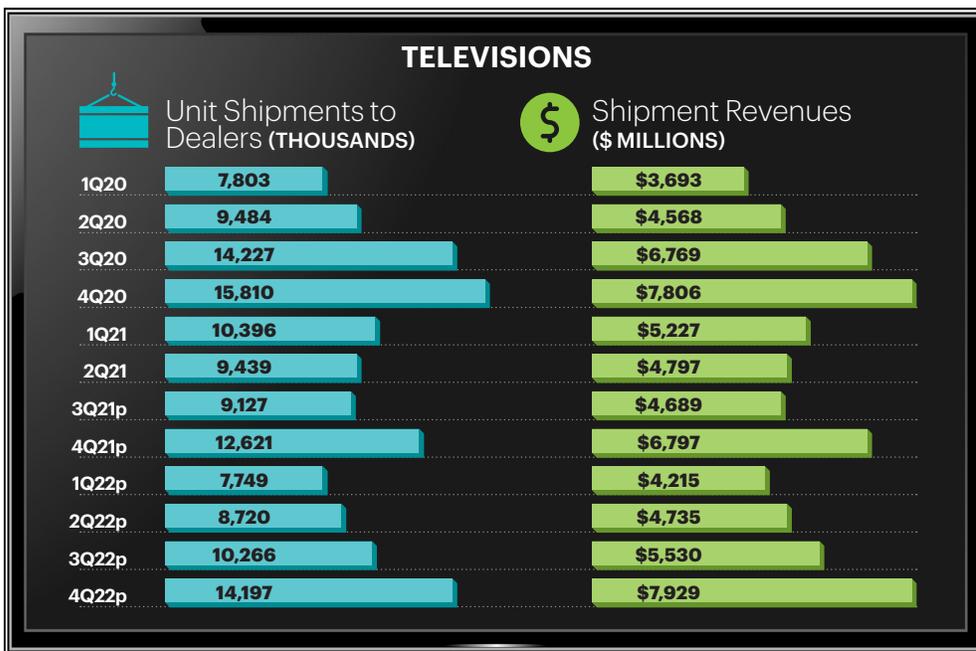
American households own roughly 270 million television sets, rivaled only by smartphones as the most popular consumer tech device in the U.S.

technology can improve contrast and dynamic range. And OLED displays — not a new technology, but highly desired for its quality — will gather momentum this year, with 2.3 million units expected to ship (up 60% over 2020).

Regardless of screen technology, shape or size, televisions remain the go-to device for movies, TV series and video gaming. American households own roughly 270 million television sets, rivaled only by smartphones as the most popular consumer tech device in the U.S.

Consumer spending on video streaming last year grew to \$35.5 billion, up a shocking 63% over 2019. As streaming services continue to propagate, CTA expects video streaming spending to hit \$40.8 billion this year. Many households will also upgrade their gaming consoles this year, meaning there will be no shortage of enticing content with which consumers can engage. And the TV will be at the center of it all.

For more details on CTA's monthly *Dynamic Forecast Reports*, contact Research@CTA.tech. ■



CT REPORTS

“Nabors” wins CTA Foundation Contest Pitch

The CTA Foundation announces the creation of the John and Jane Shalam Award

S elected from dozens of entries, seven companies competed to win the CTA Foundation’s 2021 Pitch Competition sponsored by AARP Innovation Labs. Naborforce based in Richmond, VA, emerged as the competition winner and Dance4Healing based in Sunnyvale, CA, was selected as the People’s Choice winner.

This year’s competition focused on technologies that create connections. The finalists ranged from virtual reality (VR) to digital gaming to blockchain-based memory enhancements. The companies each had three minutes to pitch followed by two minutes of questions from the expert judges including Eric Hsia, managing director, Translink Capital; Faye Sahai, managing director, Vinaj Ventures; and Monique Woodard, founder and managing partner, Cake Ventures.

Naborforce emerged victorious from the tight competition. Its program connects older adults to a network of “Nabors,” who provide social engagement and support for errands, transportation and household help. Currently available in Richmond and Charlottesville, VA and Raleigh, NC, more markets are coming soon.

The audience also voted for the People’s Choice winner, and selected **Dance4Healing**. This program uses the benefits of movement and dance to promote healthy living and activity through its remote access portal.

- The other five competitors include:
- **Chekmate, Washington, DC:** A new dating app focused on using voice and video interaction only to reduce the risks associated with online dating and to create a transparent experience.
 - **Gameboard, Boulder, CO:** A tabletop console and platform, Gameboard’s enhanced board game experience melds the physical and digital worlds.

Digital setup and scorekeeping and an unlimited play game library allow players to move easily among games and try new ones.

- **Human AI Labs, Diego, CA:** Personal AI from Human AI Labs aims to empower humans with the benefits of equitable and unbiased artificial intelligence (AI). The program enables users to retain memories with the help of personal AI secured by blockchain. Human AI transforms what users say and write into digital memories for easy recall at any time.
- **Immersive Cure, Medina, OH:** Immersive Cure leverages the power of VR to offer users a space where they can relax their mind, body and spirit. A mobile VR kit holds experiences tailored to the specific needs and wants of palliative care patients and honors veterans.
- **QBuddy, Ithaca, NY:** Short for Quarantine Buddy, QBuddy matches users with an optimal buddy and offers virtual events and community networks for safely distanced virtual friendships. The machine learning algorithm ranks and outputs best possible buddy pairings based on backgrounds and what users are seeking. Naborforce will compete in the AARP Innovation Labs Grand Pitch Finale later this year, and both winners will have mentorship and recognition opportunities through the CTA Foundation. You can listen to the [competition online](#). ■

▶ CTA JUDGES



ERIC HSIA
Managing Director,
Translink Capital



FAYE SAHAI
Managing Director,
Vinaj Ventures



MONIQUE WOODARD
Founder and Managing Partner,
Cake Ventures

THE JOHN AND JANE SHALAM AWARD

The CTA Foundation also announced the creation of a new annual award, the John and Jane Shalam Award to recognize a person, organization or company that does amazing work addressing social isolation. Chair of Voxx International and Founding Chair of the CTA Foundation John Shalam and his wife Jane have been instrumental in the CTA Foundation’s work addressing social isolation and this award will forever recognize their incredible contributions to this important issue.

▶ SUPPORT THE CTA FOUNDATION

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Thank you for your support!

MARKET BEAT

The Future of Retail

New technologies are helping to reinvent shopping.



CASHIER-LESS SHOPPING IS ON THE HORIZON

6%

of consumers surveyed have experienced an autonomous or “unmanned” store, but...



39%

say they would be likely to use one in the next 12 months.

Across America a host of transformative technology innovations are arriving at storefronts to reinvigorate the shopping experience and the broader retail sector. The result is a revamped and reengineered industry; adapted to address a more digitized consumer by melding the physical and online realms.

The amplification of online sales operations gave many retail businesses a lifeline during the health crisis, however, the digital transformation of physical stores has quietly grown apace. Technologies once thought of as science fiction, such as robots, digital payment systems, cashier-less stores and even augmented reality have established a beachhead in retail and may soon become table-stakes in retail strategy.

A Look at Some Developments

Robotics is one tech area retailers are now leveraging to support business operations. From cleaning systems to inventory management, robots are focused on improving operational efficiency. For example, Sam’s Club is deploying automated floor scrubbers across its 600 stores and other retailers are following suit. Giant Food Stores has deployed ‘Marty’ — an inventory management robot — to 172 stores in four states. And across the pond outside London, Ocado Technology operates a robotic warehouse for picking and packing groceries for home delivery.

Customer service is another aspect of the retail environment where technology is transforming the in-store experience, particularly at the checkout counter.

Mobile payment systems combined with a rising tide of cashierless stores are empowering customers with more options at the point of sale.

The appearance of self-checkout lanes across retail has arrived. Consider Amazon now operates more than two dozen Amazon Go convenience stores in the U.S., and recently opened its first store in the U.K. Powered by Amazon’s “Just Walk Out” technology, Go stores use a mosaic of sensors and deep learning technology to detect merchandise shoppers take from shelves and then track them in a virtual cart. Customers use the Amazon Go mobile app to enter stores and automatically pay when they leave with their goods.

Is the Future of Retail ‘Faceless?’

Maybe. The point is consumers endorse frictionless shopping like cashierless stores. CTA’s *COVID-19 Impact: Retail Innovations* study (Oct 2020) found 39% of U.S. consumers are likely to use them over the next year.

CTA’s research also found more than half (56%) of U.S. consumers say they plan to use contactless or mobile payment

solutions where available. Broadening acceptance of services like PayPal or Apple’s Apple Pay among consumers and storefronts suggests we are destined for a (mostly) cashless future. Already, the global digital payments market is valued

at \$6.6 trillion this year (up 40% from two years ago) and forecast to grow to \$10.5 trillion by 2025, according to analysis by Finaria, a global finance and investment company.

Augmented Reality (AR), once an experimental technology at retail, is redefining experience shopping in a

very 21st century context. The latest AR retail trend bridges physical stores and ecommerce by creating digital shopping experiences that combine the energy of in-store shopping with the convenience of online shopping. In fact, IBM’s *2020 U.S. Retail Index* report concludes the pandemic has accelerated the shift to digital shopping by roughly five years.

How is this happening? One example is prescription glasses retailer Warby Parker has developed an app that lets consumers virtually try on different eyeglass frames.

When we consider how substantially technology is refashioning retail, terms like ‘omni-channel’ take on new meaning. These innovations will likely make delineating sales between online, mobile and physical stores more challenging as these shopping experiences become inextricably linked and intertwined. ■

“**The pandemic has accelerated the shift to digital shopping by roughly five years.**”

— IBM’s 2020 U.S. Retail Index



STATS AND FACTS

Retail Innovations

The retail experience is being reimagined using new tech advances, in part due to the pandemic, providing consumers with immersive ways to purchase products and services. CTA's October 2020 study, *COVID-19 Impact: Retail Innovations* found the physical and digital spaces are merging. Robots, touchless displays and contactless payments, cashier-less stores and even augmented reality (AR) and virtual reality (VR) are being used to provide consumers with more efficient ways to shop. Consumers younger than age 35 in suburban and urban areas are the most receptive to these technologies. ■



CONSUMERS WANT TO SEE SIMPLER SHOPPING WITH MINIMAL CONTACT

Which of the following aspects of retail shopping do you believe needs the most improvement?



28%

Want Improved Product Returns



24%

Want Improved Payments & Checkout

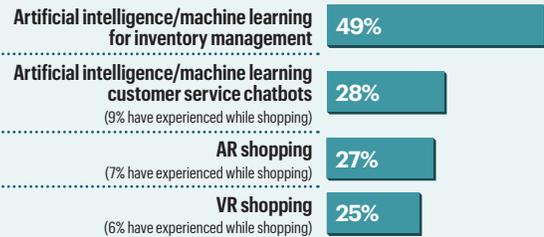


23%

Want a Better Overall In-Store Experience

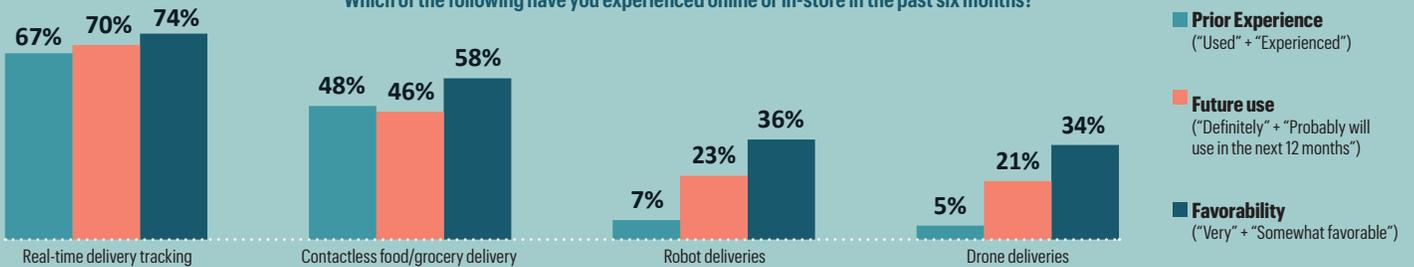
CONSUMERS ARE READY TO SEE AI AND MIXED REALITY TECH IN RETAIL

How favorably do you feel toward each of the following retail innovations?



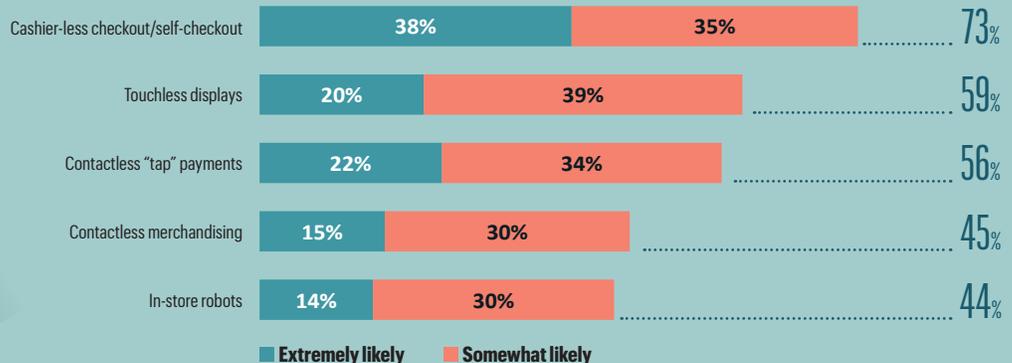
CUSTOMERS ARE READY FOR DELIVERY INNOVATIONS

How favorably do you feel towards the following retail innovations? In the next 12 months, how likely are you to use the following while shopping online or in store? Which of the following have you experienced online or in-store in the past six months?



CONSUMERS OPEN TO MORE INDEPENDENT, CONTACT-FREE SHOPPING IN-STORE

In the next 12 months, how likely are you to use the following while shopping online or in-store?



Source: CTA, COVID-19 Impact: Retail Innovations

