

# CONNECTING TRENDS

## CES 2016 OBSERVATIONS AND QUESTIONS FROM THE FLOOR

By Martin Kon, Lutao Ning, Matt Kalmus, Tim Mank, Guxin Lin, and Matthew Attanucci

*IT'S NO SURPRISE THAT CES 2016, the extravaganza once known as the Consumer Electronics Show, offered an exciting, if fragmented, look into the future. This January, some 3,800 exhibitors filled 2.4 million square feet of exhibition space—the equivalent of the world's second-largest building, if such a structure existed—to promote a nearly endless array of gadgets, gizmos, products, applications, systems, software, solutions, and technologies. CES has its roots in consumer electronics, but as technology has become more and more central to business innovation, CES has a lot to say about potential product and process developments in a widening array of industries. The big challenge is how to make sense of it all.*

*A team of experts from The Boston Consulting Group braved the tech-happy crowds (estimates put attendance north of 170,000 people), the desert sun, and Las Vegas's temptations to discern what CES can tell companies about coming tech trends. This article is not an exhaustive analysis of technologies or an attempt to "out-blog" the tech bloggers; rather it is meant to highlight what CES can tell us*

*about some significant industry developments and broader trends. Five observations from the floor, leading to a host of questions, topped the team's collective report card.*

### 1. Will My Child Learn to Drive?

It's becoming increasingly likely that children born in 2016 could *operate* rather than *drive* their vehicles when they reach driving age in 16 or 17 years. Who knows? Getting that first driver's license may no longer be an adolescent rite of passage. The convergence of automotive and digital technology is real, far-reaching, and accelerating at a pace of 0-to-60 miles per hour in less than four seconds.

Autos had a big presence at CES 2016. Two of the eight keynote speakers came from the industry; they were the only nontech representatives. Auto exhibition space was up 25%, auto companies held numerous press-day sessions, no less than three concept or new-production announcements were made, and heavy crowds queued at auto-related booths.

The following three trends from Tech East, where automotive made its CES home, have significance for technology, media, and telecommunications (TMT) companies.

**Convergence.** Auto companies are continuing to incorporate more and more digital technologies in their vehicles, and technology companies are investing more and more in the automotive industry, including rumored outsourced vehicle manufacturing. Technology can be a competitive differentiator for auto manufacturers, and technology-driven vehicles (in all senses of that term) have strong potential as product lines for technology companies.

This rapid convergence raises multiple questions, however, and players from both sides need to come to grips with them. For example, which communications technologies (such as cellular, Wi-Fi, and Bluetooth) will become standard for different automotive tasks, and which providers will take the lead in providing them? Will automotive connectivity evolve into a third ecosystem (after the home and mobile), or will drivers “bring their own access” by connecting their cars to their smartphones?

As chips in cars grow in number and the functions they serve, they are also becoming smaller, faster, cheaper, and more sophisticated. Software platforms and connectivity are becoming critical considerations. Which chips, protocols, standards, and software platforms will become standard and which companies will be the primary suppliers? How do companies collect and secure the Internet of Things (IoT) technologies that will gather massive amounts of data about, for example, driver behavior, crash statistics, and mechanical issues (data that can drive new opportunities in predictive maintenance and reduce the number of recalls)?

**Partnerships.** Two major U.S. automakers announced partnerships with technology companies during the week of CES 2016. Ford Motor Company and Amazon.com intend to link their in-car entertainment and communications systems with home-automation hub technology. General

Motors announced a strategic investment in Lyft that will see the two companies working together on autonomous-driving technology, among other initiatives. We expect to see more high-profile partnerships. Other auto and TMT companies need to be scouting the convergence dance floor for potential partners in such areas as connectivity, entertainment, and communications operating systems and sensors. For instance, if autonomous-driving technologies continue to improve, and less driver involvement in “driving” is required, what will people do with their in-car free time? What media and productivity applications will be available, how will they be consumed, and what technologies will deliver them?

**The Accelerating Pace of Innovation.** The startling pace of innovation is attracting more companies—and more types of companies—to the automotive-technology playing field. We expect to see heavy competition between current and future entrants around electrification, automation, and connectivity over the next few years. Platforms for entertainment, communications, assisted driving, predictive maintenance, and vehicle intelligence are proliferating and converging. (Think about a car that tells you when the oil needs to be changed on the basis of actual data from the oil tank and the engine rather than relying on generic mileage intervals.) As has been the case with most platform applications, a shakeout seems inevitable in the coming years. Which of the proprietary auto, open-source, and technology platforms and operating systems will gain share? Will there be a few central systems for managing auto technology, or will multiple systems interoperate across a wide variety of components from various sources to accommodate owner or driver technology choices?

The convergence of the automotive and technology industries also has ramifications for talent management and organization design. How will companies acquire and retain workers with the requisite skills? (Some automakers have already set up shop in Silicon Valley or Silicon Alley

and have established venture capital operations.) How will companies in the auto and tech industries—with their very different histories, cultures, and organizations—acquire, develop, and integrate new automotive-technology operations?

## 2. How Does a Consumer Ecosystem Evolve When Everyone Wants to Own the Ecosystem?

For the third CES in a row, the IoT was front and center, drawing long lines and big crowds. The past two years showed us that all types of products could become “smart”—no refrigerator, light bulb, or door lock was left behind. This year evidenced substantial investment by many CES household names in trying to own the consumer IoT ecosystem.

While numerous open alliances presented their interoperable products (ZigBee and Z-Wave are two), we believe that the consumer IoT ecosystem will evolve much as smartphones did, with killer devices from the likes of a Samsung driving consolidation around an ecosystem such as Android. For this to occur, however, demand will need to be generated in part through the combination of falling prices (to compete against “dumb” products and spark mass adoption) and demonstrable benefits for home and business owners.

To date, developers have been relying on existing solutions: smartphone apps and connectivity to devices such as Amazon Echo. Because most people balk at carrying around multiple devices, for consumers and businesses to see a benefit, devices need to function in a heterogeneous world, and data silos must be either connected or broken down to provide the user with a seamless experience across vendors. Poorly implemented hubs for smartphones won’t cut it for most users: seamless integration and usability across devices will be critical if IoT applications are to catch on.

Both the amount of investment over the past year and the products presented at CES this January indicate that multiple companies and organizations are looking

to establish strong footholds at the center of prospective ecosystems. Google has introduced Brillo, Microsoft and Samsung have announced a partnership, smart routers with touch screens have hit the market, the Wi-Fi Alliance has announced a low-power solution, and Bluetooth standards will soon allow for longer range, faster speeds, and mesh networking. But important questions remain, including the following:

- Is the lack of interoperability limiting development and end-use value?
- Will, as we believe, a “home run” product lead to a winning ecosystem, or will consolidation around an ultimate winner be dictated by alliances and technical prowess and interoperability?
- Will movement toward one ecosystem be quick enough to avoid the type of congestion and chaos seen in the 2.4 GHz open Wi-Fi ecosystem?
- How quickly can connectivity pricing fall, enabling consumers to connect everyday devices to the public Internet? Will there be an appetite or need if everything can connect through a smartphone or an in-home router?
- Is there a role for network operators that want to provide services beyond broadband connection? Can TV providers build the connectivity platform that controls the connected home across a wide array of devices and providers? Can a gaming console, a tablet, or a laptop become the living room hub?

## 3. Will Virtual Reality Replace TV?

At the same time that TV makers were pushing the next iteration of thinner, bigger, and better TVs with the likes of 4K HDR and 98-inch 8K screens, virtual reality (VR) was one of the biggest stories at CES 2016, with attendees lining up for 90 minutes or more to see live demonstrations. Device offerings spanned the technical-sophistication spectrum from

simple smartphone attachments priced below \$100 to dedicated high-end devices costing \$600 or more. The VR applications demoed included games, video, live experience, and workplace productivity products.

In video, TV is still king. In 2015, the average U.S. resident consumed 5.5 hours of video content per day, according to eMarketer. Of that, only 17 minutes were spent on smartphones. A key limitation, of course, is the smartphone's screen size, and that is exactly the problem that VR solves. But can VR eventually replace TV as the hub of home entertainment?

Despite some of VR's distinct and powerful advantages—user experience, no room-space limitation, and cost and footprint savings, for example—the near-term answer is no. VR is still limited by several factors, including absence of real-world personal interaction (TV remains a group experience in many instances), high cost, processing power, and lack of content.

That said, in the longer term, VR will likely win over some to a substantial amount of video consumption, gradually gaining share over the next decade. Innovations such as the HTC/Steam Vive front-facing camera and augmented-reality solutions are already exploring ways to solve the real-world interaction problems. Processing power in smartphones is already capable of running midtier VR devices. Gaming as an application for VR is ready for the consumer market, and it will drive down hardware pricing and fuel innovation. Costs are at early-adopter levels already, and entertainment content producers have announced plans for VR studios and content.

Companies in several segments need to think about the implications of this evolving shift in multiple areas, including connectivity, content delivery, content creation, and hardware. Here are some examples.

**For Connectivity Providers.** How should network operators—fixed and mobile—anticipate a significant jump in mobile-video traffic? What is the best way to achieve a seamless handoff between home and

mobile? Is fixed-mobile convergence with microcell build-out the most cost-effective way to manage rapidly expanding mobile-video traffic?

**For Content Delivery Companies.** Since VR content is delivered over the Internet, how can traditional (cable and satellite) TV-delivery companies protect margins when they are no longer the sole—or even the primary—means of accessing content? What role will VR play in “traditional” TV? Which companies will compete for and win the role of content aggregation and discovery? Hardware manufacturers? Operating-system creators? Connectivity companies? Is there still value to be found in aggregation? Or will the value in the ecosystem flow upstream to providers—or back to consumers?

**For Content Creators.** Will content creators choose to provide exclusive rights to one or a few aggregators, or will they pursue direct-to-consumer pricing and integration into all major platforms? Should content creators build their own content-distribution networks or partner with large infrastructure players? How will content creators leverage the new technology to create and monetize newer viewing experiences—for example, “courtside” experience for sports or in-story experience for horror? Will VR replace movie theaters for an immersive viewing experience?

**For Hardware Manufacturers.** Should device manufacturers create a tightly controlled ecosystem or should they build open hardware that can work across a wide variety of providers? How can TV manufacturers pivot to protect market share? What are the implications of lower manufacturing and transportation costs? How big is the ultimate market for VR peripherals? Will there be a VR app marketplace? Or a variety of add-on peripherals designed to give users an immersive multidimensional experience?

## 4. Are Start-ups Now the Way for Big Companies to Innovate?

Since 2012, CES has increasingly become a proving ground for start-ups. This year,

hundreds of new ventures showed off their products, networked with potential financiers, and stood in line for their chance to be on TV's *Shark Tank*.

Each year, however, more of the CES start-up activity involves new ventures of large corporations that are incubating or otherwise funding start-ups as their own path to innovation. Start-ups operating under a large-company umbrella have long been common in the tech industry, in which the pace of innovation is fast and the fuel for disruption (venture funding) is so prevalent. In many cases, tech giants acquire successful start-ups to remain ahead of the innovation curve.

In a trend we first highlighted in 2014, companies in other sectors are taking a page from the tech industry playbook, and some are incubating their own new ventures from scratch. We found that across six innovation-intensive industries (telecommunications, technology, media and publishing, consumer goods, autos, and chemicals), 43% of the top 10 companies had established incubators or accelerators, compared with 23% of the top 30. Almost 50% of the top 30 companies were actively engaged in venture investing as well. A growing number of large companies were also forming strategic partnerships with established start-ups to close knowledge gaps and drive value creation for both partners. (See *Incubators, Accelerators, Venturing, and More: How Leading Companies Search for Their Next Big Thing*, BCG Focus, June 2014.) It was clear at CES 2016 that venture firms such as Techstars, which partners with large companies to form accelerators, are becoming an increasingly popular way to fund innovation and diversify risk in big companies' R&D efforts.

At CES this year, a number of large companies, among them Qualcomm, Ford, and La Poste (the French public postal company), had their start-ups on display. In addition to funding, large companies provide office space, resources, mentorship, and even vendor access to accelerate the new companies' growth. Some of these investments are near their sponsor's core business: for

example, Ford has invested in connected-car technologies. Other investments, such as Qualcomm's investments in robotics, are more distant.

Some key questions: Can these forays into the start-up world compete long-term with full-time and fully committed venture operations such as Google Ventures and the legion of veterans along Silicon Valley's Sand Hill Road, and will they ultimately lead to value creation for their parent companies? Are there enough dollars set aside for this type of innovation? Are the sponsors taking on enough companies to spread the risk? Is this truly a more efficient innovation process than internal R&D programs? And conversely, if increasing numbers of large-company venture efforts are successful, will those ventures dilute the competitive advantage that players such as Google—not to mention the “unicorns” that grow out of garages—have enjoyed?

Perhaps, from the corporate sponsors' point of view, this is the most important question of all: Will this form of innovation identify the next big disruption in the parent company's core business?

## 5. To the Connected Life and Beyond

The breadth of industries represented at CES widens every year as connectivity solutions are applied in sectors as diverse as automotive, health care, food, and logistics. This year, for example, personal- and patient-centered health care took the lead. Exhibition halls were filled with all manner of fitness-tracking devices for individuals, their kids, and even their pets. These trackers—along with other technology-enabled “medical applications” that, for instance, promise to help balding people grow hair—are showing the first important signs of evolution toward providing users with the capability for a more fully “connected life.”

The connected-health movement is moving beyond the first stage of “unitasker” devices—machines and apps that automate or connect one thing (such as a heart rate monitor) or task—toward the development

of more mature, fully connected, and interoperable solutions. For instance, the combination of interoperability among sensors (such as a fitness monitor) and a smartphone (as the interface) enables health-tracking devices to automatically connect with users' health providers. Insurance companies can provide customized services on the basis of consumers' current and historical health-related data. With sufficient scale in the number of users and the volume of available data, new value propositions—such as discounts on insurance policies, more focused health-care provisioning, and advanced disaster-relief capabilities—become technologically and commercially viable.

One set of open questions concerns how far the connected-health movement will be able to take its innovations. Can a broad set of IoT capabilities begin to establish a truly connected life? Are there commercial value propositions that go beyond the current tracking of individual parameters and improvements to existing services and that will have widespread appeal for consumers? If so, who will own, analyze, and utilize all the available relevant data? How (and how quickly) will service providers (such as medical offices) be able to learn to use the data that is being made available?

Can myriad privacy concerns and security fears be addressed?

Beyond health care, a bigger question is whether this kind of interoperability and connectivity can be applied to a broader set of IoT applications that can eventually connect all (or most) aspects of the typical consumer's life—including, for example, health, home, car, workplace, and school. While much of the requisite technology exists—there are sensors, actuators, communication protocols, application platforms, user hubs, and interfaces for almost everything—there is as yet no interoperability or interconnected ecosystem among all these interfaces. Most important, there is as yet no clear commercial value proposition for consumers or an effective response to their security concerns. What steps can be taken to accelerate integration across platforms and data and to truly differentiate consumer-facing offerings? Will such integration become a differentiator, or just another service all providers offer?

One thing is all but certain. With the pace of technological developments accelerating and the breadth of their application expanding, at least some of the answers will be on display when CES convenes again in January 2017.

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