



The *Consumer Electronics Show (CES)* took place in Las Vegas from January 9-12, 2018. Under the tag line, *Whoa*, over 170,000 technology enthusiasts participated in this annual pilgrimage to Las Vegas. The number of attendees was about 9% lower than in 2017, when it was over 184,000. CES hosted over 3900 exhibiting companies.

US consumer technology market will bring in \$351 billion in sales in 2018, an almost 4% increase over 2017 sales, according to the latest research from CTA, the organizing committee for CES. This growth is fueled by consumers' interest in smart speakers, smart home devices, virtual/augmented reality headsets, drones and wearables.

The Consumer Electronics Show lost power a few times during the show. There was a collective sigh of surprise and disbelief that we can all be flying high talking about futuristic world. But no electricity means no electronics. And, that was sobering and humbling.

There was another cloud that was hanging over attendees' minds at CES: the pesky vulnerability affecting many computers, tablets, phones, and servers that hackers can use to steal data - caused by a flaw in some models of Intel, AMD and ARM chips. The cooperation among companies on this issue is admirable. However, the fact remains that the patch is not as straight forward as we initially thought and there may be unintended consequences caused by the patch. Another sobering moment!

From Smart Phones to Smart Cars to Smart Mobility

Gone are the days that industry CEO's would pull out a rectangular chunk of metal and glass from their pockets and like James Bond, show it off to feature-starved audiences. Now the industry's "it" tech gadget is the smart car. Similar trends are showing up in smart cars now.

The notions of semi-autonomous and eventually autonomous driving and connected vehicles totally expand the horizons of how we have traditionally designed, implemented and utilized transportation. CES hosted an amazing panel on Connected Mobility that quickly filled up. It is mind blowing to shatter our existing assumptions about driving, transportation and the required infrastructure. Think about changing of objectives: driving your car gives way to getting from point A to point B. Changing of skills: I never truly felt comfortable driving stick-shift cars and that was always bit of a concern in the back of my mind, which turned out to be an overblown concern. A great yoga instructor I knew, didn't drive at all and I felt bad for his limited mobility. Now, people like him don't have to be worried at all, as skill of driving might soon become relegated to a lost art, like sword fighting. An art and a pleasure that BMW doesn't want you to forget too soon as they were taking folks on figure 8 drifting rides on M3 models with lots of noise and rubber burning, which seemed quite exciting. It is no longer just the speeds that get people excited about cars. This CES saw the launch of the Byton concept car. Byton is a German Chinese car company that doesn't even try to differentiate on speed and wants to be known for its user interface design. The car's entire front dashboard is a gigantic display called a Shared Experience Display. Why worry about zero to sixty speeds when passengers can focus instead on what else they need to order from Amazon. And, if you have enough sensors, why bother with side mirrors which Byton has eliminated. Also, Byton thinks car handles would be a thing of the past with face recognition. All the amazing features of smart cars are possible courtesy of big-pipe connectivity to the cloud and lightning-fast response times, which takes us to need for 5G. Renault-Nissan-Mitsubishi announced a new VC fund to invest \$1B in mobility startups over next five years.

5G to Enable Autonomous Driving and Much More

The upcoming Pyeongchang Winter Olympics will be a transformative event in multiple ways. For one, it will be the first time in a long time that the two Koreas will march as one country. More importantly for us, the tech junkies, it will be the first global showcase of 5G, the next generation of broadband networks, by SK Telecom, KT, and LG U+. The first set of 5G standards, called non standalone 5G New Radio, was just approved by 3GPP in December. 5G is expected to power live streaming and live VR experiences at game venues. Please recall Arvani Group's model of DNC; Device, Network and Content which all have to be present for a new network to be operational. For D, we would need 5G devices. At CES, we heard some vendors promising 5G smartphones by end of 2018 and early 2019. The final chips (not prototype) for these devices will push the device rollout to 2019. For N, networks are getting ready. By end of this year, AT&T

plans to have a dozen 5G networks and Verizon is expected to launch fixed 5G for residential broadband in three to five markets in US. For C, as far as content and applications are concerned, we don't need to be worried as we already have tons of high fidelity content like 4K videos that are notoriously slow on today's networks. And, with the advances in augmented and virtual reality applications and autonomous driving, we have plenty of applications with which to welcome 5G.

Making Sense of the World

At this CES, there were lots of sensors to make our devices more observant. Voice assistants were integrated with many devices. Amazon's Alexa was integrated in plenty of applications from Toyota cars to Vuzix's augmented reality glasses to Nokia's Health Mate health monitoring app. Google was fiercely fighting back with its Hey Google interactive kiosks everywhere with white-jumpsuit-clad staff giving away prizes. It is amazing how Alexa quietly won over consumer's hearts and minds over Apple's Siri and Google's still-unnamed assistant. Apple just announced its HomePod home speaker would be available on February 9th challenging current incumbents Alexa and Google Assistant. L'Oreal unveiled a "fake fingernail" patch that detects ultra violet rays and warns the wearer of spending too much time in the sun.

Displays Get Modular & Flexible

CES has traditionally showcased the latest in TVs, getting bigger and brighter. This year, Samsung's The Wall TV prototype at 146 inches was certainly the biggest, but its beauty lied in its modularity. The Wall is composed of tiles using Micro LED technology to produce its picture. LG, as usual, had the most amazing entrance. This time, It was the LG OLED Canyon, where you could walk through a curvy 90-foot path surrounded by floor to ceiling curved displays showing breath-taking nature videos of canyons and water falls. There were 246 LG Open Frame OLED displays in concave and convex configurations.

CES showcased several augmented reality and virtual reality glasses. HTC showed a new version of its Vive, the Vive pro, with over 70% resolution upgrade to 2880X1600 combined which apparently allows one to read in VR.

Artificial Intelligence Rolled Off Every Tongue

Artificial Intelligence (AI) was or claimed to be in many of the CES showcases, from autonomous cars to robots to drones and wearables and everything in between. This year, CES even featured an Artificial Intelligence marketplace. Most are currently going for a narrow set of functionality like home assistants. Very few are aiming at general intelligence like Hanson Robotics and know they have a long way to go. Nvidia unveiled the Xavier system on a chip for processing AI in autonomous cars. Intel announced a neuromorphic chip, named Loihi, for AI on the edge. The chip is architected to simulate brain neurons and synapses in silicon. Loihi simulates 130,000 neurons and 130 million synapses. According to Intel, this kind of chip is well suited for AI applications like image recognition and autonomous driving.

Rows of Robots

There were plenty of robots at CES. There was a robot that folded your laundry if the laundry was fed to it one at a time. There was the Buddy robot that offered home security, played with your kids and elderly and looked adorable. There was Sophia, a humanoid robot, from Hanson Robotics who took her first steps during the show. Sony's Aibo robot dog is back powered by AI with two OLED eyes and two cameras and can fetch its special ball and bone. Aibo supposedly overtime learns to do what pleases its owners. These robots are not cheap. Buddy will sell for about \$1500 and Aibo is selling in Japan for about \$1700.

CES showcased many possibilities in robot design, hardware and software, sometimes without much focus on its usability. LG gave a live demo of its home assistant robot Cloi powered by its own ThinQ AI software at its press conference. Cloi was supposed to show how it can communicate with the home appliances. Unfortunately for LG, Cloi stopped responding after the first question. Oops!

As the robotics industry matures, we expect to see more attention to use cases and user requirements.

And One More Thing ... (maybe four more!)

Esports is becoming a global phenomenon. According to Consumer Technology Association, esports has more than 385 million fans globally. IBM displayed the prototype of its 50-qubit quantum computer. Intel announced a 49-qubit quantum computing chip. Kodak's stock shot up 120% after it announced plans for its crypto currency, KodakCoin.

Disclosure: Azita Arvani runs Innovation Partnering and Ecosystem Ventures at Nokia Networks. This report does not reflect Nokia's views.
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