

TWIN GLOBAL CHALLENGE SESSION

The Future of Mobility – Electric, Autonomous and Shared Vehicles

September 25th, 2018
Chicago Connectory



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The Future of Mobility – Electric, Autonomous and Shared Vehicles

Introduction

TWIN Global is an annual convening of innovation and growth leaders from across sectors and geographies. Challenge Sessions, a central part of the TWIN experience, are designed and facilitated working sessions where curated participants discuss topics of common interest. The goals of these Challenge Sessions are to inspire thought, spark discovery and connection, and imagine a path forward on the topic by engaging a broad range of perspectives and stakeholders.

On September 25, 2018, over 30 invite-only participants gathered at the Chicago Connectory to discuss the mobility revolution. Participants included visionary leaders from inside and outside the transportation and energy sectors, with representatives from industry leaders such as Ford

Motor Company, Bosch, Exelon, and ConEdison, as well as other leading companies across multiple sectors, premier academic institutions, think tanks, incubators and investors driving change in the mobility space. Through a combination of keynote perspectives, panel discussions, and collaborative breakouts, the diverse group of participants discussed the exciting future of mobility – the implications for climate change and clean cities, the traditional utility power grid as well as the changing regulatory landscape.

The following document summarizes speaker and panel highlights, highlights insights and themes from discussions throughout the session, and provides implications and recommendations for a path forward.

Session Lead:



Session Sponsors:



Challenge Session Leaders:

Paul Donnellan Partner, Clareo
Casey Bankord Senior Principal, Clareo

Summary Author:

Esther Li Analyst, Clareo

KEYNOTE SPEAKER HIGHLIGHTS

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JOHN KWANT, VP OF CITY SOLUTIONS, FORD SMART MOBILITY

- ▶ The first keynote was delivered by John Kwant, VP of City Solutions at Ford Smart Mobility, a group Ford has formed to develop and invest in mobility solutions. With the Smart Mobility group, Ford is seeking to balance the roles of industry incumbent and industry disruptor. The venture is still guided by Ford's historical vision of 'democratizing' transportation, an old term imbued with new meaning as Ford moves to address new mobility in cities.
- ▶ Kwant noted that the industry must move from a business model focused on vehicles sold to one of passenger vehicle miles traveled, as the concept of shared use and servitization takes off. He discussed Ford's passion for designing the vehicle around the human perspective, using data insights and robust research to dig deep on how people actually use the vehicle. He posed a design

“Mobility players are just actors. The overall operating system is digital.”

challenge for a solution that would help consumers during the day and also during off hours: how do you use the same vehicle you drive during the day to deliver goods during the night? Kwant stated that, the vehicle experience will increasingly become inseparable from the digital experience. Not only will vehicles be connected to smart infrastructure, the Cloud and other users, but connectivity and digital access will be the tools vital to unlocking the future of transportation, cities, and new business models. Ford's vision for the future of mobility is a one enabled by technology, partnerships and research but ultimately centered around the human experience.



STEFAN GSPURNING, HEAD OF DIGITAL MOBILITY SOLUTIONS NA, BOSCH

- ▶ Gspurning summarized changes in technology, population growth, urbanization, climate change and changing consumer values as the biggest drivers of change in mobility. Mobility traditionally meant trying to go from point A to point B, with the vehicle as a means to do that. Now companies must rethink the whole mobility system, in a future where different modes of transportation are interconnected and mobility becomes more of a service model with many options for your transportation needs.
- ▶ Gspurning also noted consumers' changing values – driven by the millennial generation demanding connected/sharing services, sustainable solutions and integrated experiences. He emphasized the future of mobility requires co-creation - between governments, businesses, entrepreneurs and even consumers to create options that are cleaner, cheaper, and more accessible for a variety of users. Doing so doesn't necessarily eschew traditional public transportation or non-autonomous vehicles, but rather means rethinking the entire paradigm of transportation in cities to reimagine an integrated and connected experience.

“Mobility should be co-created, especially in cities. Problems in each city can be unique, so solutions can be hyper-local.”

Discussion and Takeaways from Keynote Speakers

Clareo partner Paul Donnellan moderated a discussion with the keynote speakers around the exciting future of transportation, with more connected and accessible services built for the human experience, but one that also has had its share of challenges and setbacks. One of the biggest challenges is understanding how various stakeholders can collaborate, partner and contribute to that future. New mobility will not be solved by one company, but will require an ecosystem of industry participants – insurance companies being one example. And every city is different, so every city will require different tools, talent, and vitally, infrastructure to support connected and accessible services.

It was noted that while cities will be at the helm of mobility, cities are not moving at the pace of the technology. Kwant responded that while some cities are budget constrained, they do have a history of successfully building communities for sharing information and experiences and are open to new funding models. A question was posed: Should cities have a P&L for the curb, with peak pricing?

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SUNNY ELEBUA, VP CORPORATE STRATEGY, EXELON

- ▶ Elebua highlighted the importance of the empowered consumer in an age of information transparency, social activism, and urban renewal. Mobility is evolving, not because OEMs or utilities are pushing change, but rather because consumers and cities are demanding new solutions for gridlock and other challenges.
- ▶ Consumers, governments and business need to dialogue about what it really means to transition from gasoline to electric – economically and politically, the impact it will have for existing and new infrastructure, and whether the future of electric, autonomous and shared transportation will be truly accessible to individuals of all different social and economic backgrounds. Elebua noted that utilities, as regulated entities, have an opportunity to influence social equity for mobility, including infrastructure investments that could spur transportation electrification.
- ▶ Technology will play a huge role in this transition because it will enable more efficient solutions. To better understand this transition and the pace of change, Exelon has engaged with national labs, universities, and startups like Volta, which is focused on energy storage.

“All of this requires social equity. If you paint a picture of the future that looks like it’s only for a certain class of individuals, it won’t work.”



**BRIAN ROSS, PROJECT SPECIALIST, DRI
DEMONSTRATION PROJECTS, CON EDISON**

- ▶ Ross is focused on helping charging system operators build out charging infrastructure in New York City. With about 2 million registered passenger vehicles and three-fourth of owners parking in streets and garages, Ross sees a huge need for public and fast charging stations, and a supporting business model for the operators.
- ▶ One key challenge is the economics around charging stations – there are high capital costs to installing the infrastructure, and the solution requires a combination of incentives. Despite ConEdison actions on make-ready investments, incentives on demand rates and offers to subsidize operating costs, there is still an economic challenge for operators. The second challenge is finding space in cities to install stations – an issue apt to loom larger as urban areas increase in density. Ross noted the solution will have to come from a broad group of stakeholders, including community leaders, transport authorities and utilities to make public charging a reality.

“This is a big change management program. A lot of actors need to get together to solve these charging infrastructure problems.”

Discussion and Takeaways from Utility Perspectives

Clareo partner Paul Donnellan moderated a discussion with the utility panelists that focused on how to partner for outcomes. Ross noted that governments and notoriously are bureaucratic, so grassroots movements are critical for creating momentum. However, Ross also noted that the working through governments might not be a bad thing, as it facilitates the sharing of information across stakeholders and mandates solutions that better fit the needs and mobility patterns of the city.

In terms of priorities for transportation electrification, Elebua cited the need to balance societal benefits with an understanding of the constraints. Improving the emissions of port authority fleets is an early target, as are short-haul buses such as those at airports. Both Ross and Elebua identified electrification of municipal fleets as one of the biggest opportunities. These cleaner buses can impact the communities these utilities serve, including those that are economically challenged.

When asked about the challenge of convincing cities and other governments for action, the speakers emphasized the need for pilots to prove the benefits and using grassroots engagements to share ideas.

PANEL: THE INTERSECTION OF TECHNOLOGY, BUSINESS MODELS AND POLICY

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A clear theme emerging from the panel on utility perspectives was that collaboration is key, and solving roadblocks in transportation will require intersecting viewpoints from technology, business and government. Our diverse group of panelists from LACI, Rand Corporation, HERE Technologies, and IIT's Robotics Lab shared their own perspectives for the future of mobility.



KELLY SCHMANDT FERGUSON, DIRECTOR OF MARKET TRANSFORMATION, LOS ANGELES CLEANTECH INCUBATOR

- ▶ With LA's notorious congestion and pollution problems, Ferguson spoke about how LACI is working to creating a green economy and sustainable cities. LACI is trying to move the needle in transportation through partnerships with utilities, regulators, corporate organizations, technology players and startups. Pilot projects include partnering on solutions for long-range truck operations and providing mobility in transit deserts. As an example, LACI is working with the City of Long Beach aims to better integrate active transit and electric vehicles with other transportation options to provide residents with more last mile, first mile solutions while reducing greenhouse gas emissions and improving air quality.

“Our focus is on creating an inclusive, green economy, working through the lenses of economic development, reducing emissions and improving air quality.”



DAVE GROVES, CO-DIRECTOR OF WATER AND CLIMATE RESILIENCE CENTER, RAND CORPORATION

- ▶ A future with autonomous vehicles with carbon neutral transportation on demand and zero fatalities is the dream, but getting there will be a long road. And there could be negative consequences with increased congestion and some communities left behind. Groves noted concerns about regulations not keeping up with the pace of technology change, or the safety and ethics, of autonomous vehicles. A recent Rand study concluded that more lives could be saved with a faster introduction of autonomous vehicles, than delaying their introduction until they were “almost perfect.” Groves spoke of policies with flexible and incremental standards, rather than inflexible or chilling conditions for innovation and collaboration. He advocated for establishing clear benchmarks for providers, rather than demanding certain technologies.

“Establish clear benchmarks for providers, rather than demanding certain technologies.”

PANEL: THE INTERSECTION OF TECHNOLOGY, BUSINESS MODELS AND POLICY

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MONALI SHAH, DIRECTOR OF INTELLIGENT TRANSPORTATION, HERE TECHNOLOGIES

- ▶ While data is vital to the future of mobility, sharing that data and creating data standards is needed so that data can be connected. Companies have historically operated in data silos, but in the last few years Shah has seen progress as competing vehicle companies are now sharing data and the public sector has created open data portals for sharing. Shah emphasized how technology must ensure equal access to new mobility services. Stakeholders should also think about ways to enable employment opportunities and enable people to get training on specific skill such as data management.

“*Competing vehicle companies are now sharing data and the public sector has created open data portals for sharing.*”



MATTHEW SPENKO, ASSOC.PROFESSOR, THE ROBOTICS LAB, ILLINOIS INSTITUTE OF TECHNOLOGY

- ▶ Spenko focuses on safety in his lab, especially around localization of robots (where it is in its environment) through sensors and AI. His research works to quantify probability that sensors will have faults, to then quantify the probability of safety with those systems – how well can we trust these systems. The aim is to share that data with policy makers to ensure transportation safety in communities. Spenko is also seeking to apply learnings from the FAA to autonomous vehicles. The agency has a framework they use based on decades of analysis to improve air traffic safety, with an incredible safety record. There is an opportunity to apply the techniques to ground vehicles to improve safety of autonomous vehicles.

“*How well can we trust these systems? We want to quantify safety and provide it to government and regulatory agencies.*”

Discussion and Takeaways from Panel

Mark Werwath, Northwestern University Clinical Associate Professor and Director of Master of Engineering Management, moderated the panel discussion. Technology has led the mobility revolution, but technology has now hit a ceiling where it doesn't always benefit the greater good. Cities are facing issues of congestion, pollution, degrading infrastructure and inequality – but these issues also provide an opportunity for mobility leaders to find solutions, beginning with testing and piloting concepts by *involving* the community. There exists a symbiotic relationship between technology and cities – tech needs sites for pilots, and cities need innovation from technology to solve old problems. The key to a successful working relationship between the two will be understanding local needs and cultures, scaling for adoption and aligning on priorities.

After a thought-provoking and inspirational morning session, Challenge Session participants reconvened in the afternoon to discuss themes, insights and implications for the path forward.

THEME

New Mobility will Transform Cities

Cities will be the testing ground for piloting autonomous, shared and electric services. Cities are the epicenters for growth in the developed and developing world, as younger generations seek employment opportunities, culture emersion and social connections. New mobility must provide a seamless mass transit system for these expanding urban areas. This requires replacing dilapidated infrastructure with new smart infrastructure; engaging in organic and intuitive city planning to meet the population boom; and finally, balancing business growth with sustainable operations. For example, the city of Atlanta has challenged the industry to speak with 'one voice' for autonomous vehicle infrastructure needs, rather than having the city respond to each original equipment manufacturer's (OEM) individual requests.

THEME

Regulation Needs to Keep Up with the Pace of Change

The last decade has been marked by remarkable technology transformation and business model innovation in the mobility space, but governments and regulatory bodies are still living in a different era. To catch up, these key players must define federal safety standards for autonomous vehicles, redesign cities around electric charging stations, and reimagine transportation as a connected and shared system consisting of fleets, public transits, bikes, scooters, and even drones. Doing so requires fundamentally changing the bureaucratic working model through enabling more public/private partnerships (initiated by industry), fostering new funding models, and shifting to an open and more collaborative culture. Alliances amongst companies for self-regulation could also be needed to accelerate adoption and achieve new mobility goals.

THEME

Electric Vehicles at the Tipping Point for Adoption

Buoyed by longer ranges of electric vehicles, demand for cleaner cities and a growing understanding about vehicle charging, more consumers are looking to purchase electric vehicles, especially in California. Key challenges still remain, notably around enhancing charging infrastructure, lowering cost, improvements in battery technology, and managing the grid. To increase adoption of electric vehicles the value proposition for customers must tie to customer needs and convenience. Utilities have a role to play in expanding charging infrastructure and an opportunity to influence social equity for carbon-free mobility. Pilot demonstration projects will be needed to gather better data for modeling infrastructure needs.

THEME

Consumers Drive the Demand, But Also Demand Transparency, Safety and Information

There have never been a wider range of transportation solutions available – from autonomous vehicles, to shared transit and last mile services, but consumers aren't just satisfied with flashy headlines promising the latest and greatest. They demand realistic solutions with genuine value proposition. The media is currently driving conversations around electric and autonomous vehicles and their implication for sustainability, safety, ethics, and accessibility, but consumers want to be a part of that conversation and help shape the solutions. The future of mobility is in the hands of startups, OEMs and utilities, but also in town halls, courts, and schools. Adoption isn't just about creating the product and services, but also about education, reshaping norms, altering behavior, and ensuring trust among robust and sustainable ecosystem of stakeholders.

Be Bold – Work Quickly, Experiment, Learn and Act

As cities grow and urban areas become dynamic hubs of culture and employment for Millennials and Generation Z all across the world, the path forward requires incumbents and startups alike to work iteratively, test, pilot, and redesign solutions for constantly changing consumer needs. Cities throughout the world will have different transportation needs, and industry success stories will be ones that learn how to design for and cater to those specific needs.

Dialogue, Collaboration and Partnerships are Critical to Realizing the Future of Mobility

No one company or group can reach the future of mobility alone. But a diverse coalition of passionate, visionary, and empowered leaders from all different backgrounds can work together to achieve that future. Revolutionizing mobility is not an easy ask – it requires rethinking some of our most basic and long-held assumptions about what cities look like, how humans live, work and travel, and what it means to be responsible and compassionate members of our global society. Governments, OEMs, utilities, startups and constituents all feel an urgency to create a better future, but dialogue, collaboration and partnerships are a necessary and critical starting point. At this vital inflection point in our history, the opportunity has never been greater to reimagine and realize the future of the mobility.

PARTICIPANTS AND SPONSORS

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Participants

Tim Woods	Autonomous Vehicle Alliance
Stefan Gspurning	Bosch
Dr. Wal van Lierop	Chrysalix
Erik Birkerts	Clean Energy Trust
Brian Ross	Con Edison
Satish Chandra	Cummins
Sergej Mahnovski	Edison International
Haisong Tang	Elite Educational Institute China
Dave Chen	Equilibrium
Kristen Brown	Exelon
Sunny Elebua	Exelon
Brian Hoff	Exelon
Vignesh Krishnamurthy	Ford Smart Mobility LLC
John Kwant	Ford Smart Mobility LLC
Raymond Loh	HERE Technologies
Matthew Spenko	Illinois Institute of Technology
Monali Shah	HERE Technologies
Elizabeth McGee	Intel
Kelly Schmandt Ferguson	LA Cleantech Incubator
Declan Flanagan	Lincoln Clean Energy
Joe Renz	New Mobility Consulting
Mark Werwath	Northwestern University
Dave Groves	Rand Corporation
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Florence Samson	Song Fang Tea
Robert Saik	The AGRI-TREND Group
Jamie Ponce	UI Labs
Elizabeth Kocs	University of Illinois at Chicago
Dennis Kerrigan	Zurich North America



About The World Innovation Network

The World Innovation Network (TWIN) is an invitation-only community of innovation and growth leaders from across sectors and geographies. In addition to other activities, TWIN convenes annually for a summit in Chicago from 25 countries and all sectors: business, government, non-profit, the arts, academia, defense. Our group includes leaders at the most senior levels of their organizations, as well as select individuals making differentiated impact around the world.

Learn more at twinglobal.org



About Clareo

At Clareo our mission is to help businesses adapt and grow. We help leaders adapt their businesses and create new ways to grow in rapidly changing markets. Together, we build the plans and capabilities that deliver results. Our clients choose Clareo when they want bold new ideas fueled by a network of leading global experts. Working alongside our clients, we create compelling strategies that lead to action.

Learn more at clareo.com

Thank You

Thanks to Clareo's Talent Director, Lucy Jeong-Adler, for acting as the session coordinator. And a special thanks to our sponsors.



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SIGNALS FROM TODAY

->>> ELECTRIC VEHICLES

Vox

July 18, 2018

Electric vehicles are gaining momentum, despite Trump

"We are on the front end of a steeply rising S-curve, a rate of change not seen in the US transportation sector for decades."

San Francisco Chronicle August 21, 2018

California paradox: SUVs sell briskly, but so do electric cars

New registrations of light trucks and SUVs in the state rose 5.6 percent during the first half of 2018, while EV/hybrid sales accounted for 6% of the market.

THE VERGE

August 16, 2018

Electric cars could use another big battery breakthrough — this CEO says he's got it

Henrik Fisker's new company is now just a few months away from putting the finishing touches on the final design for a scalable solid-state battery, which are safer had have longer range than liquid state batteries.

Transport Topics

Sept.11, 2018

Truck Makers Move Closer to Commercial Electric Vehicles

ACT Research forecasts commercial electric vehicles will make up a "significant share" of the Class 4 through Class 8 market in 2030 to 2035.

Transport Topics

Sept. 4, 2018

Home Charging Needed for Electric Vehicles to Gain Traction

Home-location charging is the most frequently used and the most influential in the purchasing decision and the electric vehicle usage.

gtm.

August 21, 2018

Startup Aims to Prevent EV Charging From Overloading the Grid

NREL is testing a novel adaptive load management system from PowerFlex, which is aimed at building owners looking to provide EV charging points e.g. in parking lots, to offset peak demand.

FAST COMPANY

Sept, 11, 2018

Your UPS deliveries may soon arrive in electric trucks

"We're trying to make sure that we're diversified enough that we can go in a couple of different directions, but we do know that electrification is in our future."

Bloomberg August 22, 2018

Electric Trucks Facing Long Road to Unseat Diesel Engines

"Diesel isn't going down without a fight."

Diesel will be the primary option for heavy duty trucking markets, long haul especially, for a decade or more, compared to electric trucks that are more viable where you have shorter routes, less loads and you're able to recharge.

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Vera, Volvo's Electric & Autonomous Truck Concept



Eluminosity, a startup working to put charging components on infrastructure to enable convenience



Mercedes' "Ubanetic" Electric Modular Car Concept

Sources: Vox, SF Chronicle, Bloomberg, TT News, Compelo, GreenTech Media, The Verge, Fast Company, E-Hike.net, Qz.com

SIGNALS FROM TODAY

->>> VEHICLE SHARING AND PERSONAL MOBILITY

electrek Sept. 6, 2018

Uber predicts it will offer more rides on electric bicycles and scooters than cars

"We want to be the Amazon of transportation. And hopefully, 10 years from now, no one in the audience is going to own a car."
(Dara Khosrowshahi, CEO)

autoblog August 25, 2018

VW plans to bring 'We Share' EV car-sharing to U.S. by 2020

"We Share" takes to the road with what is known as free-floating car sharing, ensuring the spontaneous availability of electric vehicles for customers at all times. At a later stage "We Share" will be adding smaller vehicles as micromobility solutions to its fleet of electric cars.

MIT News Sept. 4, 2018

E-commerce spurs innovation in last-mile logistics

"On-demand services create flexibility for logistics providers and retailers by letting them temporarily expand delivery capacity. They can cover the baseload with their own fleets, and then use on-demand services to cover peak periods, as well as the most urgent and cost-insensitive delivery requests."

CBINSIGHTS Sept. 5, 2018

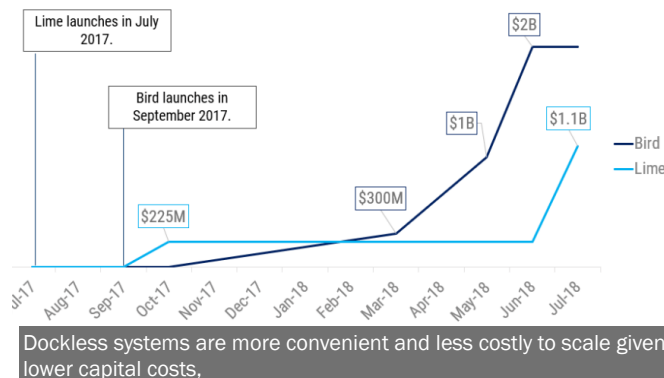
Disrupting The Car: How Shared Cars, Bikes, & Scooters Are Reshaping Transportation And Cannibalizing Car Ownership

Part of the hype surrounding the micromobility space stems from the fact that roughly 60% of trips in the US are five miles or less; traditional bikes, as well as e-bikes and e-scooters, tackle the first- and last-mile problem.

"Instead of getting keys for a 16th birthday—which used to be a symbol of freedom in America—you get a Lyft subscription... You have use of bikes and scooters; you have a certain amount of miles just like you have minutes on your phone."

Bird, Lime reach unicorn status in a matter of months

Private market valuations for scooter startups Bird and Lime



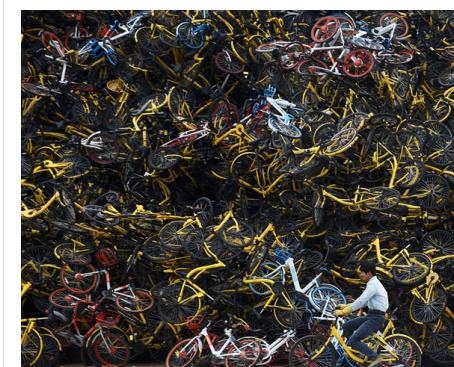
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PYMNTS.com August 31, 2018

In San Fran, Scooters Make (Controlled) Return

"Bike litter" has been a problem across several U.S. markets and China, where bikes are dumped haphazardly on sidewalks, in driveways and in all manner of public places. San Francisco will grant permits on an individual basis.



A worker rides a shared bicycle past a huge pile of unused shared bikes in China.



Sources: Electrek, MIT, Clean Technica, Washington Post, Vox, The Atlantic, Autoblog, CB Insights, Pymnts.com, Inside EVs

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August 28, 2018

Toyota invests \$500m in Uber as part of autonomous vehicle partnership

The AV fleet will be based on the platform for Toyota's Sienna minivan, and will include integrated support for Toyota Guardian and Uber's self-driving platform.

San Francisco Chronicle August 16, 2018 After Uber accident, fewer people want self-driving cars

"Just like prisons and nuclear power plants, it's now a NIMBY situation when it comes to autonomous car testing,"



August 31, 2018

Apple reports first autonomous vehicle collision in California

Apple has 66 autonomous vehicles approved for testing in California.

"From our point of view, autonomy is sort of the mother of all AI projects." (Tim Cook)



Sept. 10, 2018

Mercedes-Benz's new mobility concept is autonomous, electric, modular, and ugly

Many people are experiencing AV technology not through vehicles owned by giant companies like Google or Uber, but as passengers in tiny, autonomously driven shuttle buses popping up in cities across the country.



Sept. 6, 2018

People don't trust autonomous vehicles, so Jaguar added googly eyes

A 2018 survey by AAA found 73% of American don't trust AVs.

"A face gives us hundreds of tiny clues...to inform about a vehicle's intentions."



Volvo's New 360C concept – Reimagining Work-Life Balance in Cities

THE WALL STREET JOURNAL Sept. 13, 2018

Driverless Hype Collides With Merciless Reality

We don't yet know how to pull off a computer driver that can perform as well or better than a human under all conditions.



August 16, 2018

Ford says slow and steady will win the self-driving car race

Ford believes that "developing self-driving vehicles is not simply about the technology — it is about earning the trust of our customers and of those cities and businesses that will ultimately use it."



crunchbase news April 4, 2018

Startup Marble Aims To Bring Robots To Last-Mile Delivery Space

"The way that goods are delivered to your doorstep hasn't changed," he said. "But consumers' expectations are narrowing, demand is tightening and urbanization is increasing."

Sources: The Verge, ZDNet, Fast Company, CNBC, Divvy Bikes, BigThink, WSJ, Crunchbase