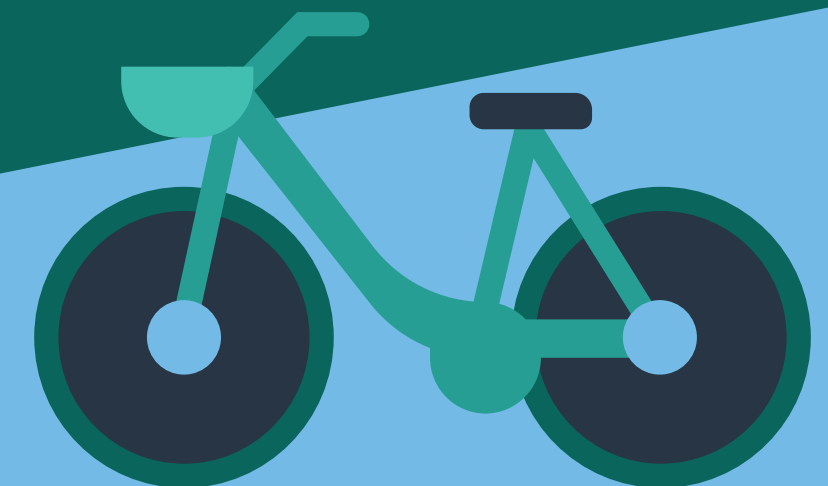


Mobility Tech

Q4 2019

Report preview

The full report is available through the PitchBook Platform.





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Executive summary

Consumer transportation is a massive global industry. In the US alone, households have spent roughly \$1.1 trillion annually for “on-road” transportation services, which includes the purchase, operation and maintenance of personal vehicles.¹ However, despite the size and maturity of this market, it is rife with inefficiencies. Vehicles are often underutilized while large incumbent auto manufacturers and taxi service providers remain stagnant. This stagnation is reflected in the market capitalizations of the world’s largest auto companies which, for the past decade, have been relatively unchanged and have dramatically underperformed the broader stock market. While automakers have gone a long way in integrating automation technologies to extract more efficiencies from existing processes, these changes have not had a transformational impact on the industry. At the same time, the consistent rise in auto loans underscores increasing consumer reliance on cars even as the average automobile sits parked for 95% or more of its usable life.²

The development of the digital economy and mobile connectivity has altered this paradigm, giving rise to new technologies and business models that cater to what we see as strong underlying demand for low-cost, convenient and efficient mobility solutions. We believe this emerging industry of alternative mobility has helped bridge the divide between legacy methods of transportation and emerging methods of digital communication. This industry has given rise to several disruptive products and services including ridesharing and delivery platforms, micromobility scooter and bike services, commercial-scale fleet management tools and emerging autonomous vehicle technology. As the world becomes increasingly connected, we believe demand for mobility tech—or the intersection of transportation and technology—is higher than ever.

Venture funding has been key to fueling the growth of mobility tech. Since 2009, venture investors have poured \$197.3 billion into mobility technology, with \$33.5 billion invested across over 750 deals in 2019. This sustained ability to finance capital expenditure-heavy private mobility startups helped fuel the rise of Uber and Lyft, two companies revolutionizing and disrupting traditional methods of consumer—and increasingly commercial—transportation. We believe autonomous vehicles may represent the next phase of disruptive mobility technology, with startups such as **Zoox** and **TuSimple** poised to usher in a new era. This report provides an overview of the mobility tech landscape and the products and services of the venture-backed startups in the space.

1: “TET 2018–Chapter 6–Household Spending on Transportation,” Bureau of Transportation Statistics, United States Department of Transportation, n.d.

2: “Cars Are Parked 95% of the Time’. Let’s Check!” Reinventing Parking, Paul Barter, February 22, 2013



Mobility market map

Autonomous vehicles



Perception software

Simulation & development tools

Teleoperation

Cameras

Full stack

Lidar

Radar

Electrification



EV charging, battery & motortech

Electric vehicles

Fleet management & connectivity



V2X

Connectivity & data management

Fleet management

Cybersecurity

Parking

Passenger safety

Companies included are VC-backed, segmented by primary value proposition and sorted by total capital raised as of December 31, 2019



Ridesharing



Augmented interior

Demand planning

Ridesharing platforms



Carsharing



Auto commerce



Digital marketplace



Financing & subscriptions



Repair & maintenance



Air taxis



Urban air mobility



Unmanned aerial vehicles



Transportation logistics



Last-mile delivery

Freight



Micromobility



Network operators



Vehicle suppliers



Management & analytics platform



Companies included are VC-backed, segmented by primary value proposition and sorted by total capital raised as of December 31, 2019

SEGMENT DEEP DIVE

Autonomous vehicles



AUTONOMOUS VEHICLES

Figure 8.
Notable autonomous vehicles VC deals





COMPANY	DATE	SUBSEGMENT	STAGE	DEAL SIZE (\$M)	LEAD INVESTOR	VALUATION STEP-UP
 STRADVISION	December 19, 2019	Perception	Series B	\$27.0	POSCO Capital	42.6%
 arbe	December 16, 2019	Radar	Series B	\$32.0	China Everbright	N/A
 may mobility	November 27, 2019	Full stack	Series B	\$50.0	Toyota Motor	174.6%
 vayyar.	November 20, 2019	Radar	Series D	\$109.0	Koch Disruptive Technologies	N/A
 WAYVE	November 18, 2019	Full stack	Series A	\$20.0	Eclipse Ventures	N/A
 METAWAVE	November 5, 2019	Radar	Series A	\$30.0	Denso	209.1%
 ZOOX	October 22, 2019	Full stack	Series C	\$200.0	Lux Capital Management	N/A

Figure 9.
Notable autonomous vehicles VC exits

Source: PitchBook | Geography: Global | *As of December 31, 2019

COMPANY	DATE	SUBSEGMENT	EXIT VALUE (\$M)	ACQUIRER/INDEX	VALUATION STEP-UP	VALUATION METRIC
 LATENTLOGIC	December 12, 2019	Simulation	N/A	Waymo	N/A	N/A
 DEEPSCALE	October 1, 2019	Perception	N/A	Tesla	N/A	N/A
 Scotty	August 21, 2019	Teleoperation	N/A	DoorDash	N/A	N/A

Source: PitchBook, *Avery Dennison, **NXP Semiconductors, ***Dialog Semiconductor | Geography: Global | *As of December 31, 2019

SEGMENT DEEP DIVE

Ridesharing



RIDESHARING

Opportunities

Emerging markets: As incumbents Uber and Lyft have staked out most of the US market, we see upside for network operators serving emerging markets. Local operators have significant competitive advantages as they understand the nuances and complexities of local markets that deter global competitors. Uber's failures in foreign markets underscore this trend. In Egypt, for example, the company eventually acquired local competitor Careem for \$3.1 billion (a premium valuation) after failing to gain significant share. Other emerging markets opportunities include **Grab** and **Go-Jek**, the largest ridesharing and fintech platforms in Southeast Asia. Smaller ridesharing competitors in Southeast Asia include **Be (Car Booking)** and **Go-Viet**. South Asia represents another area of opportunity, where venture-backed startup Ola has begun operating its own fleet of electric vehicles. In South America, local companies including **Cabify** and **99** compete with Uber and **Didi Chuxing**.

Europe: While efficient and widely used public transportation and strict regulations complicate the European market, we still see sizable growth ahead. Uber views Europe as a 1.9 trillion-mile TAM opportunity, or roughly 54% of the US opportunity, and we believe ridesharing is a convenient alternative for medium-length trips in some European cities. We believe the largest markets in Europe include Germany, the UK, Scandinavia, France and Italy. The largest VC-backed European ridesharing companies include **Cabify**, **BlaBlaCar**, **Bolt** and **Heetch**.

Fintech services: Facilitating payments and offering other financial services can be a key differentiator for mobility platforms that can drive stickiness and cross-sell opportunities. Seamless payment processing was a key driver of Uber's early adoption in the US and

Europe, and the company continues to push into additional financial services, such as deposit accounts and credit cards. In Southeast Asia and South America, mobility companies such as **Grab**, **Ola**, **Rappi** and **Go-Jek** have also moved into fintech; and China's WeChat and Alipay offer wide-ranging services from payments to ridesharing.

Selling in-ride products and services: Startup **Cargo** sells snacks, consumer products and entertainment content to Uber riders taking longer trips. The company operates on a revenue share basis with drivers, has partnered with Uber to create a rider rewards program and has over 20,000 drivers signed up in the US. Assuming just 1% of Uber's 6.7 billion annual trips (based on the annual runrate per the company's Q2 results) result in a \$10 purchase, **Cargo** could be exposed to a \$670 million revenue opportunity.

Niche ridesharing: Many startups are focused on providing user-specific ridesharing services, such as female or child-focused ridesharing. Companies offering ridesharing services for minors include **Zum** and **HopSkipDrive**. These platforms target parents and provide on-demand or pre-arranged transportation services to shuttle children between school and other activities. Drivers on these platforms are typically thoroughly vetted with more stringent background checks and training. Brazil-based **Lady Driver**, which raised a seed round in June 2018, and Canada-based DriveHER match female drivers to female passengers to provide a safer rider experience. Long-range ridesharing platforms, such as **Hitch Technologies**, focus on matching multiple riders to drivers taking longer trips. Ridesharing app **Wingz** focuses on prescheduled airport rides and creating personal relationships between travelers and drivers.

SEGMENT DEEP DIVE

Micromobility



MICROMOBILITY

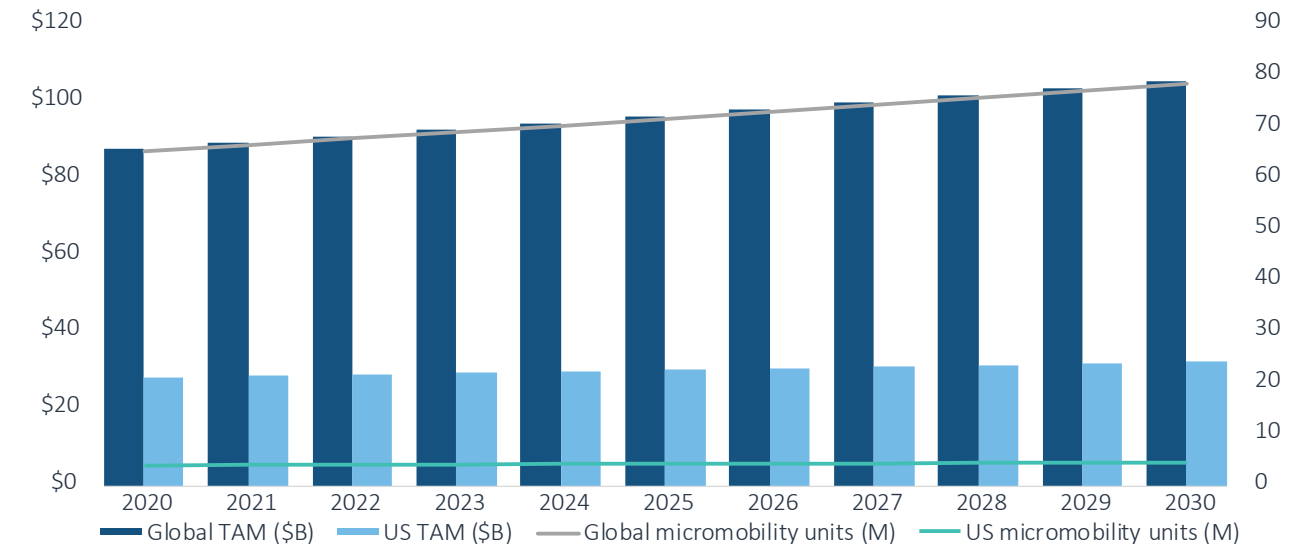
Market size

We forecast the global micromobility industry will represent a \$105 billion TAM by 2030. A primary driver of this industry will be the expanding global middle-income population as more people move to the world's cities and urban locations. According to the UN, one in five people today lives in a city with more than 1 million inhabitants, and that number is projected to increase to nearly one in three by 2030. The global middle class is forecast to grow to 5.2 billion people in 2030⁹ from 3.2 billion in 2016.¹⁰ According to the Brookings Institution, 88% of the next billion entrants into the middle class will be in Asia, in countries such as India, China, Indonesia and Vietnam.¹¹ We see relatively higher growth opportunities within these emerging regions relative to more mature countries.

Our TAM analysis incorporates the growth in global population in urban settlements and assumes a market penetration rate among these settlements based on population density. We assume urban centers of greater than 500,000 people can support an average of two micromobility units per 100 people, which is in-line with scooter penetration in mature markets in the US such as San Diego and Austin. Among settlements with lower density, we assume a market penetration of one unit per 100 people. This drives a total global unit population of 78.6 million in 2030. We also assume each unit can generate an average revenue of \$1,342, based on differences in global purchasing power. This leads us to our global TAM estimate of \$105 billion and US TAM of \$32 billion.

9: "The World's Cities in 2016," United Nations, 2016
 10: "The Unprecedented Expansion of the Global Middle Class," Brookings Institution, Homi Kharas, February 28, 2017
 11: Ibid.

Figure 23. MICROMOBILITY TOTAL ADDRESSABLE MARKET SIZE



Source: PitchBook | Geography: Global
 Note: Given the nascent nature of the micromobility market, we chose to conduct a total addressable market (TAM) analysis to assess the future potential of this technology.

Figure 24. COMMON INDUSTRY KPIS FOR MICROMOBILITY COMPANIES

Operational

- Scooter life (days operational before replacement)
- Rides per day
- Net revenue per ride
- Scooter cost
- Charging cost per ride
- Repair cost per ride
- Payment processing and insurance cost per ride
- Contribution margin %
- Customer acquisition cost (CAC)
- Monthly active users (MAUs)

SEGMENT DEEP DIVE

Fleet management & connectivity



FLEET MANAGEMENT & CONNECTIVITY

Overview

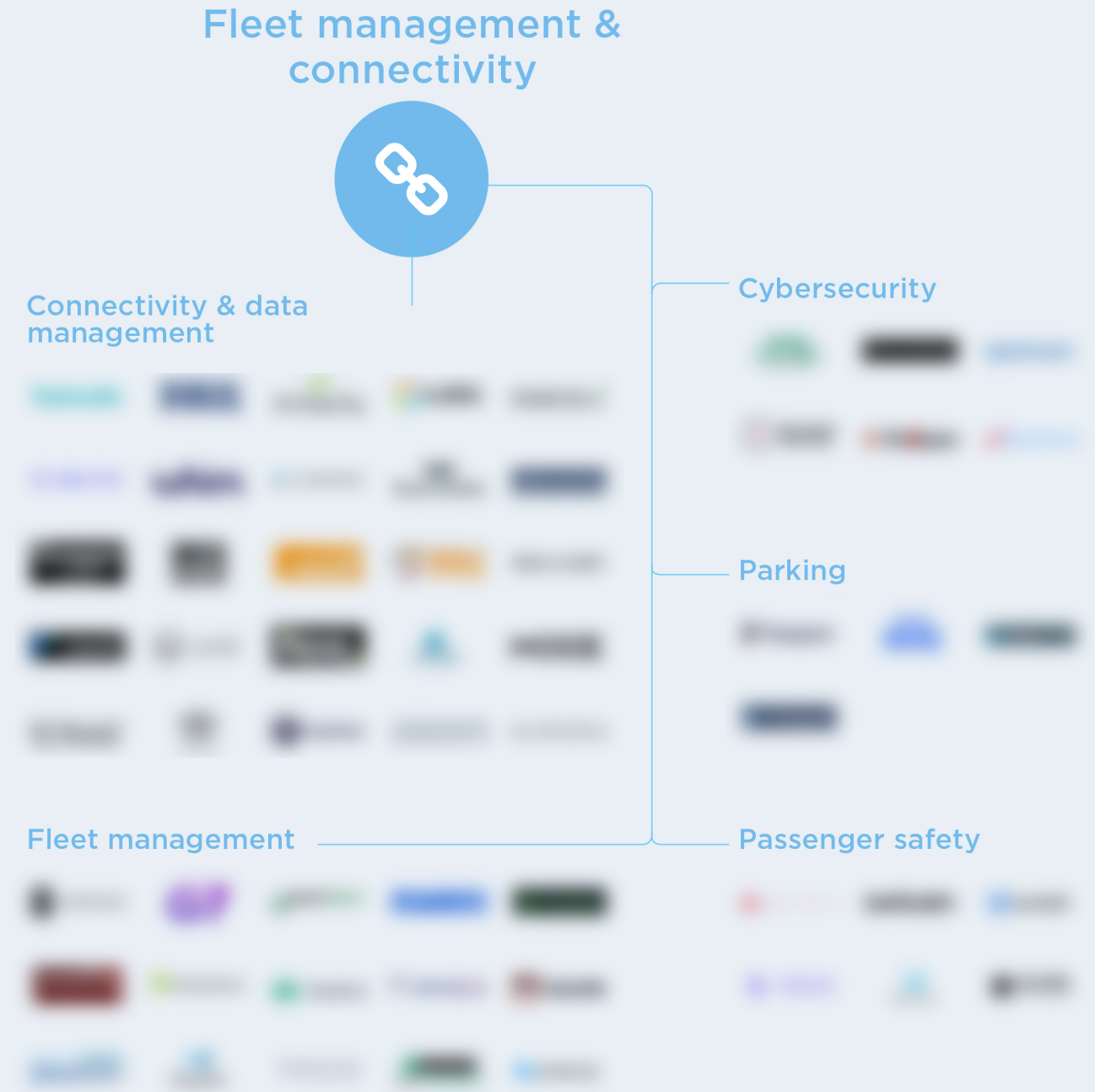
Fleet management & connectivity solutions providers connect vehicles to people, networks and infrastructure. This segment includes connectivity and data management platforms, fleet management platforms and tools, parking applications, passenger safety tools and automotive cybersecurity technology.

Connectivity & data management: Companies in this subsector seek to build platforms and tools that enable cars to communicate bidirectionally with other systems. Companies such as Autonomic and **Wejo** are developing connected car platforms to serve as operating systems for mobility. While others provide software tools that enable data collection, processing, management and sharing.

Fleet management: Companies in this subsector provide mobile workforce platforms and solutions for service-based businesses operating fleets (i.e. UPS, long-haul trucking). Services include tracking, routing, scheduling and monitoring fuel consumption and driver behavior. Providers can also ensure compliance with policies, monitor diagnostics, document damages, update inspections and schedule repairs and services.

Industry drivers









Demand for better in-car information systems: Consumer benefits of connected cars include consistent access to cloud services, the merger of various information channels to create a unified experience and the ability to provide information to drivers, such as delays and safety hazards.





FLEET MANAGEMENT & CONNECTIVITY

Figure 58.
Key VC-backed fleet management & connectivity companies

COMPANY	TOTAL VC RAISED (\$M)	SUBSEGMENT	KEY PRODUCTS	LEAD INVESTORS
 samsara	\$530.0	Connectivity & data management, fleet management	Industrial IoT solutions, fleet management tools	Dragoneer Investment Group, Andreessen Horowitz, General Catalyst
	\$510.0	Fleet management	AI-based fleet management platform	Hopu Investment Management, China Development Capital, GLP
 SMARTDRIVE	\$320.5	Fleet management	Driver monitoring and fleet management platform	TPG Sixth Street Partners, Michelin North America, Oak Investment Partners
	\$290.0	Connectivity & data management, fleet management	Predictive maintenance industrial analytics, fleet management tools	Baillie Gifford, Illinois Growth and Innovation Fund, Valor Equity Partners
	\$285.2	Connectivity & data management	Pay per-mile insurance services, connected car app	Intact Ventures, Tokio Marine Holdings, New Enterprise Associates
	\$174.2	Fleet management	Driver monitoring and fleet management platform	SoftBank, Greylock Partners, Playground Global
	\$169.1	Connectivity & data management	Traffic and parking data and analytics platform	Intel Capital, Porsche
	\$107.4	Auto cybersecurity	IoT and industrial cybersecurity platform	Sway Ventures, Shasta Ventures, Trident Capital

Source: PitchBook | Geography: Global | *As of December 31, 2019



Mobility tech VC funnel

This VC funnel uses PitchBook data to analyze the VC funding life cycle by highlighting, by round, the number of firms that successfully raised a subsequent round, exited (through acquisition or IPO), went out of business or did not have a further liquidity event.

