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The future of mobility: What's next?

Tomorrow's mobility ecosystem—and how to succeed in it

Part of a Deloitte series on the future of mobility™

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Introduction

Frictionless, automated, personalized travel on demand—that's the dream of the future of mobility. And the future mobility ecosystem's various elements are coalescing to realize that dream sooner than expected, which means that incumbents and disruptors need to move at top speed to get on board.

BEN is exhausted. It's 9 o'clock on Friday evening, he's been at his desk for 13 hours, and he's clocked more than 70 hours this week. All he wants is a quick bite to eat and to head home, as quickly and painlessly as possible. He pulls out his smartphone and scans the options that his mobility app suggests. Train or bus? Too many stops. A carpool vehicle? He's in no mood to make small talk with strangers. He opts for his own autonomous taxi, price be damned, and tacks on his standard order from the local pizzeria.

The small electric car—no driver—picks him up a few minutes later, just as Ben steps through the front door and onto the sidewalk. His slice (with extra onions) is still steaming when he opens the pizza box sitting on the car's table; the taxi picked it up moments before Ben climbed in. He settles in and enjoys an episode of his favorite guilty-pleasure reality show that the car has cued up for him. The cost of the whole trip is instantly deducted from his account. Twenty minutes later, he's at his apartment door. Half an hour after that, he's fast asleep, dreaming about his plans for the weekend.

A journey like Ben's, and the complex web of actors required to make it happen, may be possible sooner than many of us imagine.

A year ago, we posited that the extended global automotive industry was undergoing an unprecedented transformation into a new mobility ecosystem.[1] Since then, the pace of change has been, in our view, breathtaking. Through hundreds of conversations with corporate executives, government leaders, technologists, and academics around the globe, we have gained a front-row seat to how the future of mobility is evolving. In particular, we have witnessed:

Broad acceptance of the core tenets of how this evolution will unfold. Skepticism persists and uncertainty abounds, but we have seen surprising agreement that a fundamental shift is driving a move away from personally owned, driver-driven vehicles and toward a future mobility system centered around (but not exclusively composed of) driverless vehicles and shared mobility (see sidebar). Less agreed upon: the speed at which this

transformation will take place, how the future ecosystem will be constructed and function, and how corporate leaders believe their enterprises' business models need to adapt.

Governments catalyzing the emergence of a new mobility ecosystem. The US Department of Transportation (DOT) launched the Smart Cities Challenge as a fillip for cities and states to experiment with cheaper, faster, safer, greener, more efficient, and more convenient transportation for citizens.[2] The 78 submissions, including that of eventual winner Columbus, OH, spanned a wide range of intermodal innovations and provided an incubator for new forms of transportation and new ways to consume mobility, potentially making them available and commercially viable sooner than a market-only approach would create.[3] The DOT continues to serve its primary mission of public safety, while demonstrating that it can play a pivotal role in driving innovation through investments and regulation.[4] States such as Nevada,[5] Michigan, Pennsylvania, and Florida[6] are developing pilot programs and implementing regulatory changes to accelerate adoption of the future mobility ecosystem, as they seek to provide more and better options for their citizens and to spur economic development.

Significant moves by industry incumbents and disruptors to enact the future. As we anticipated, both sets of players have come to the realization that collaboration is key to gaining a value-added role within the ecosystem. Many of these moves are speculative, exploratory, and of a nature to create option value.[7] Noteworthy examples include GM's $500 million investment in Lyft and acquisition of Maven, a carsharing platform;[8] Ford's launch of Ford Smart Mobility and investments in Velodyne, SAIPS, Nierenberg Neuroscience, and Civil Maps;[9] Daimler's investments in Moovel and Car2Go;[10] and multiple efforts by both technology companies and automakers to develop autonomous vehicles. And while these are important developments, they likely represent just the early stages of the transition. We anticipate large-scale, in-market pilots in the next 12 to 18 months; the introduction of commercially available fully autonomous electric vehicles (either as part of shared fleets or for private ownership); and tangible examples of what the cities of the future will look like, including the reduction of curbside parking, intelligent traffic signals, and the emergence of seamless intermodal transportation choices.

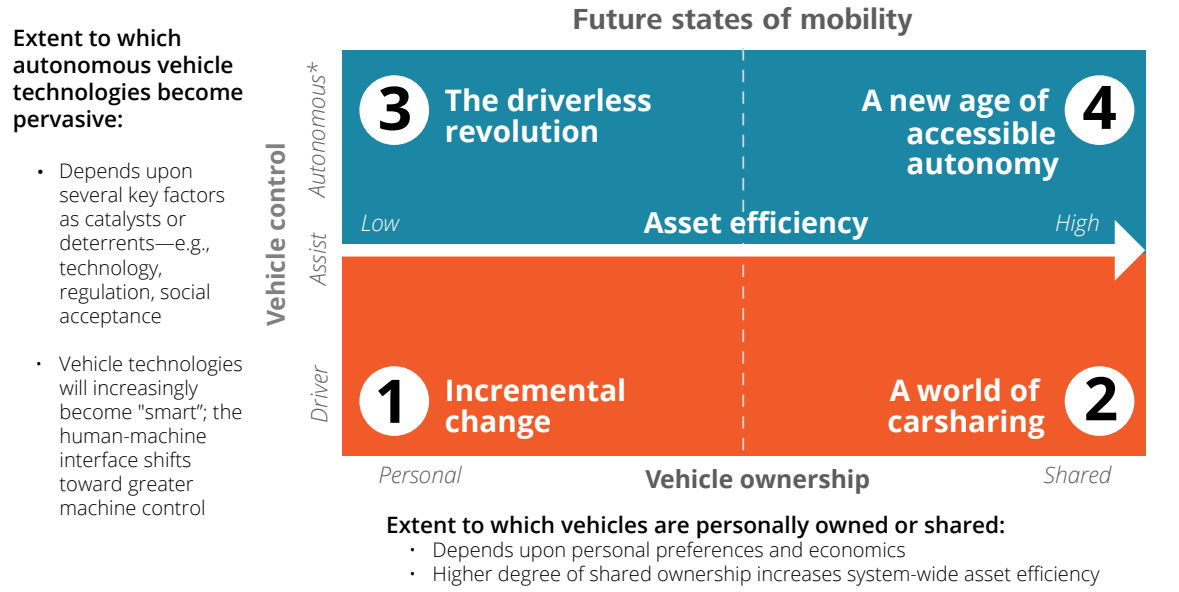
Given this dynamic and changing environment, many questions remain:

- How quickly will the future arrive, and how sweeping will the changes be?
- What will the new ecosystem look like, and how will it operate?
- Where will value be created and captured?
- How should an organization transform its strategy, business model, product portfolio, and capabilities to succeed?

This paper aims to advance the collective thinking around answering these questions. It extends our initial perspectives and incorporates new insights and analyses gained from an extensive and ongoing dialogue with most of the key players driving these changes. Ultimately, we hope this article provides a roadmap of sorts, helping stakeholders determine where to play and how to win.

In *The future of mobility*,[11] we argued that four concurrent "future states" would emerge within the mobility ecosystem, emanating from the intersection of who owns the vehicle and who operates the vehicle: incremental change, a world of carsharing, the driverless revolution, and a new age of accessible autonomy (figure 1).

Figure 1. The future states of mobility



*Fully autonomous drive means that the vehicle's central processing unit has full responsibility for controlling its operation and is inherently different from the most advanced form of driver assist. It is demarcated in the figure above with a clear dividing line (an "equator").

Source: Deloitte analysis.

Graphic: Deloitte University Press | DUPress.com

1) **Incremental change:** This vision of the future sees private ownership remaining the norm as consumers opt for the forms of privacy, flexibility, security, and convenience that come with owning a vehicle. While incorporating driver-assist technologies, this future state assumes that fully autonomous drive doesn't completely displace driver-controlled vehicles anytime soon.

2) **A world of carsharing:** The second future state anticipates continued growth of shared access to vehicles through ridesharing and carsharing. Economic scale and increased competition drive the expansion of shared vehicle services into new geographic territories and more specialized customer segments. As shared mobility serves a greater proportion of local transportation needs, multivehicle households can begin reducing the number of cars they own, while others may eventually abandon ownership altogether.

3) **The driverless revolution:** The third state is one in which autonomous drive technology* proves viable, safe, convenient, and economical, yet private ownership continues to prevail. Drivers still prefer owning their own vehicles but seek driverless functionality for its safety and convenience. This future will see a proliferation of highly customized, personalized vehicles catering to families or individuals with specific needs.

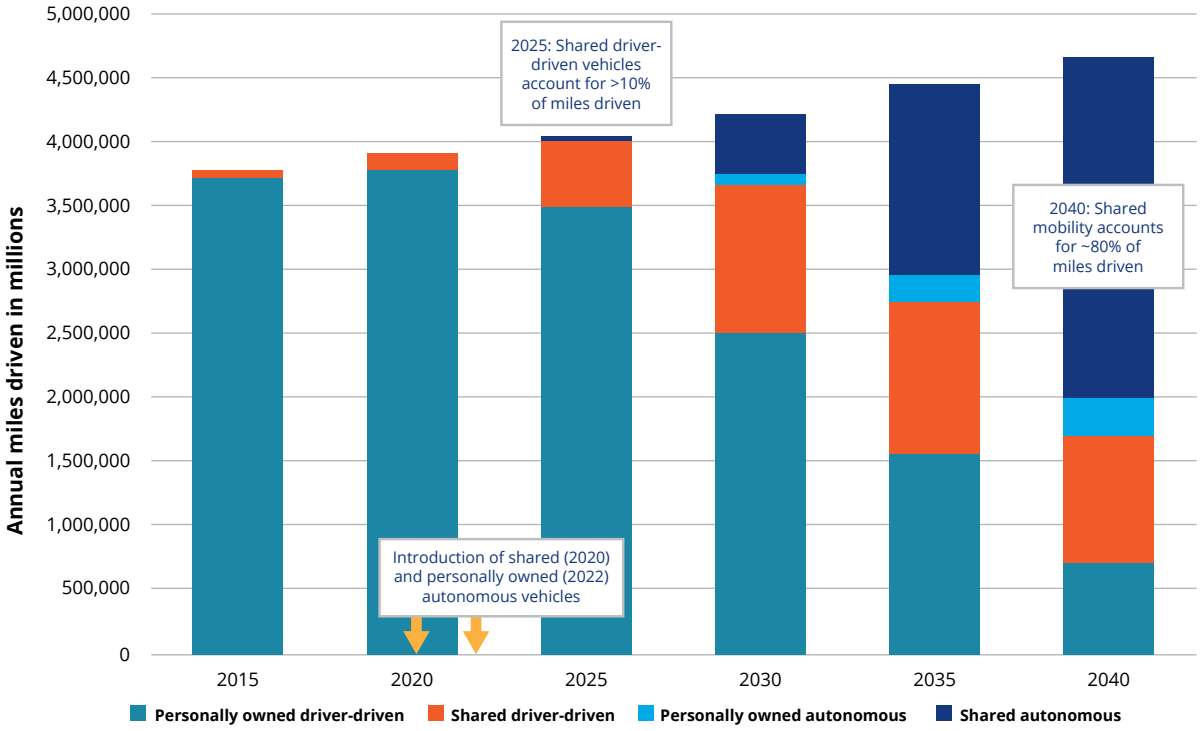
4) **A new age of autonomy:** The fourth future state anticipates a convergence of both the autonomous and vehicle sharing trends. Mobility management companies and fleet operators offer a range of passenger experiences to meet widely varied needs at differentiated price points. Taking off first in urban areas but spreading to the suburbs, this future state provides seamless mobility.

*Definition: By autonomy and autonomous vehicles (AV), we refer to stage 4 of the NHTSA's scale of autonomy—i.e., full self-driving automation in which the passengers are not expected to take control for the entire duration of travel.

An impending transformation

OUR own analysis suggests these changes could occur more quickly and at greater scale than many are prepared for, especially in densely populated areas.[12] If shared and autonomous vehicles are adopted as quickly as other technologies (like smartphones, cellphones, and the Internet), our modeling finds that significant change will begin within five years and that the market for personal mobility could transform dramatically over the next 25 years (see appendix for additional details). Population growth and the extension of transportation to the previously immobile, such as adolescents, elderly, lower-income groups, and those with disabilities, could cause total miles driven to increase by as much as 25 percent by 2040 (figure 2 and 3). Note that, while the developments discussed earlier give us some confidence that change is coming quickly, we have not attempted to model sui generis adoption rates using, for example, consumer attitudes, consumption patterns, or regulatory developments around shared and autonomous mobility. Of course, if these services and technologies are adopted at slower rates more akin to electricity, the radio, or the television, the speed and magnitude of the changes will lessen accordingly and potentially significantly.

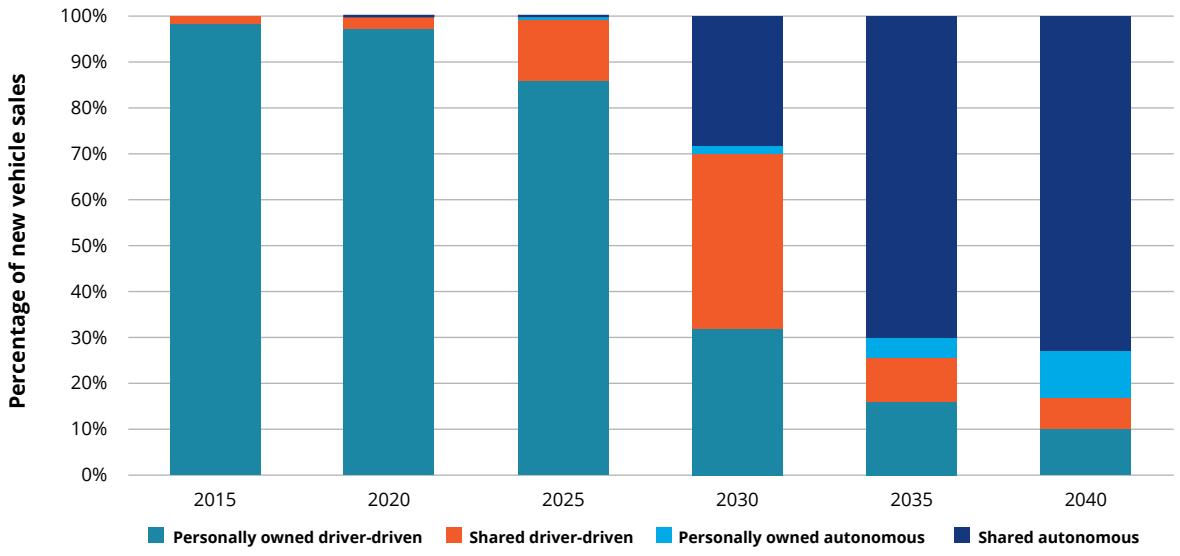
Figure 2. Forecast of total miles driven in the United States



Source: Deloitte analysis based on publicly available information. See appendix for data sources.

Graphic: Deloitte University Press | DUPress.com

Figure 3. Forecast of new vehicle sales distribution in urban areas in the United States



Source: Deloitte analysis based on publicly available information. See appendix for data sources.

Graphic: Deloitte University Press | DUPress.com

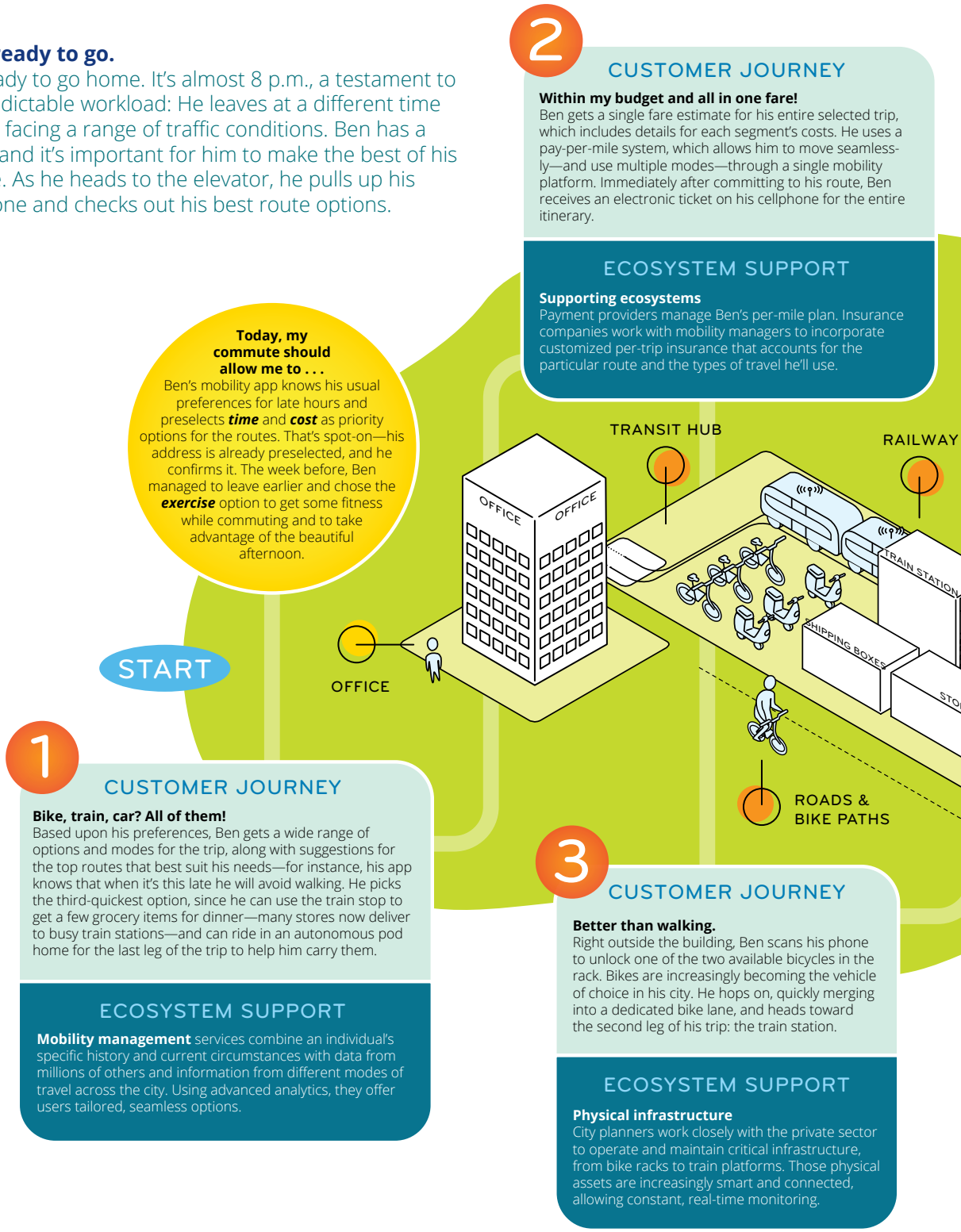
Imagining the future of mobility: An ecosystem in action

SINCE the shift toward shared autonomous mobility will likely happen fastest and most dramatically in urban environments, we broaden the aperture to imagine how people and goods will actually move in the future, and what types of vehicles, technologies, data, services, and capabilities are needed to make that movement possible.

To explore a future urban mobility ecosystem that delivers seamless intermodal transportation faster, cheaper, cleaner, and safer than today, let's revisit our friend Ben. After a restful weekend, Ben is back at work Monday and has already put it in a full day at the office (figure 4).

Figure 4. The mobility ecosystem in action

OK, I'm ready to go.
Ben is ready to go home. It's almost 8 p.m., a testament to his unpredictable workload: He leaves at a different time each day, facing a range of traffic conditions. Ben has a busy life, and it's important for him to make the best of his commute. As he heads to the elevator, he pulls up his smartphone and checks out his best route options.



4

CUSTOMER JOURNEY

Let me run some errands.
After a smooth ride, Ben parks at the station's bike rack near the entrance. His smartphone, sitting in his pocket, sends an electronic signal enabling him to access the platform and board the train. While en route, Ben shops for a few grocery items he needs for dinner. The in-app selection is a little restricted, a natural constraint of having fresh groceries available at the station upon his arrival.

ECOSYSTEM SUPPORT

Digital infrastructure providers offer ubiquitous, high-speed (5G) connectivity that enables smooth and secure online experiences. Horizontal operating systems and improved telecommunications are critical for supporting Ben's journey. Beyond entertainment, this critical infrastructure becomes an integral part of the journey from point A to B.

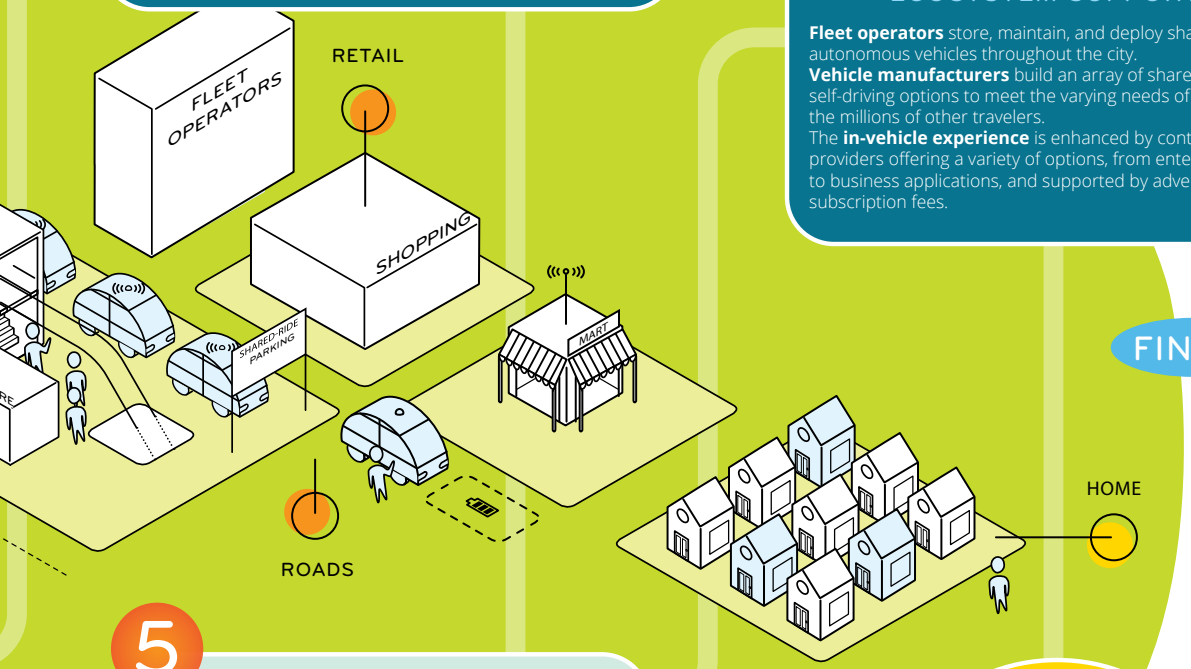
6

CUSTOMER JOURNEY

My ride awaits . . .
Toting shopping bags, Ben walks toward the rideshare pickup area outside of the train station, where his autonomous pod picks him up. His ride is short, but he is still able to catch the highlights of his favorite team's win on the car's screen.

ECOSYSTEM SUPPORT

Fleet operators store, maintain, and deploy shared autonomous vehicles throughout the city.
Vehicle manufacturers build an array of shared self-driving options to meet the varying needs of Ben and the millions of other travelers.
The **in-vehicle experience** is enhanced by content providers offering a variety of options, from entertainment to business applications, and supported by advertisers and subscription fees.



5

CUSTOMER JOURNEY

Where's the food? I'm hungry.
After a 30-minute ride, Ben disembarks and looks for the station's grocery-store lockers; a smartphone app unlocks a compartment where his items have been placed for him. He picks up the grocery bags, checks that his order is complete, and continues his trip.

ECOSYSTEM SUPPORT

Retailers and logistics providers have reconfigured operations to enable nearly on-demand provisioning of products to consumers.

This was an affordable five-star ride!
Finally, as soon as Ben's pod drops him off at his front door, his mobility app emails him a summary of the trip. He is able to see how much money the entire trip cost and track his spending pattern and accruals over the course of the month. He is able to rate his ride, and the trip overall, as well as provide feedback and report any issues back to the mobility system.

Graphic: Deloitte University Press | DUPress.com

Placing bets on the future of mobility: New opportunities to create value

Of course, individuals' transportation needs are nearly as idiosyncratic as their fingerprints, so consider this an illustrative example. But it is likely that enabling a seamless intermodal journey will require a future mobility ecosystem that is much more complex than today's extended automotive industry. New opportunities will emerge to deliver the diverse experiences that customers like Ben demand. Companies will look to design new products, services, and solutions that serve each future state and multiple modes of travel simultaneously—or accept a narrowing of their future horizons in a more diverse mobility ecosystem. Both incumbents and disruptors are beginning to stake out positions, and in the process providing the contours for how that ecosystem might look (see figure 5). But the first step is understanding to what roles companies might aspire, and what capabilities will be required to succeed in tomorrow's ecosystem.

Both incumbents and disruptors are beginning to stake out positions, and in the process providing the contours for how that ecosystem might look.

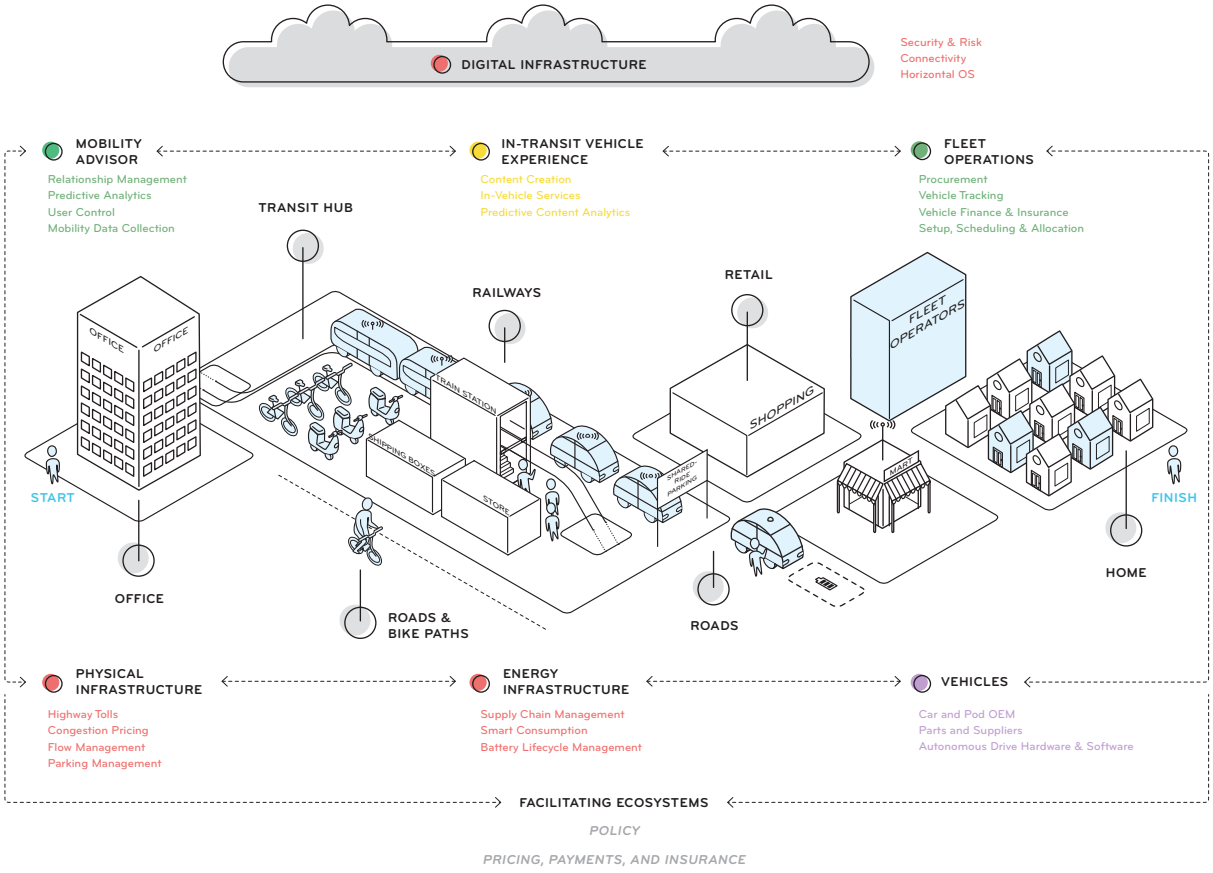
Vehicle development

The development and manufacturing of cars (and trucks, buses, trains, and bikes) will continue to provide a critical source of value. But like the mobility ecosystem as a whole, the carmaking business will be more complex than ever. New products will likely emerge, from small utilitarian autonomous "pods" to highly customized, personally owned self-driving cars. And the changes won't be limited to the passenger auto: Self-driving technology will likely infuse trains, buses, commercial trucks, and other forms of transit, demanding that developers and manufacturers evolve their capabilities accordingly.

Incumbents and new entrants, alone and together, are actively seeking to position themselves for this future. Nearly every major automaker and a variety of technology companies are actively investing in autonomous drive technology.[13] Ford, GM, Local Motors, and others are developing advanced, additive manufacturing (3D printing) techniques to support the engineering and manufacture of customized vehicles[14] And multiple companies look poised to bring extended range, affordable electric vehicles to market in the coming years.[15]

These moves suggest that the traditional capabilities of vehicle manufacturers and suppliers will

Figure 5. The future mobility ecosystem and required capabilities



need to expand, collaborating with autonomous vehicle technology suppliers, software developers, and others to provide a much broader range of product choices. There are complex economics in being able to manufacture vehicles similar to today's mass-produced driver-owned cars, highly customized personally owned autonomous vehicles, *and* utilitarian pods for urban environments. Manufacturers will likely require not only today's traditional supply chains but new manufacturing capabilities that allow advanced, low-cost, efficient customization. They will need to determine if they should redesign their business model to compete in all four future states or to focus on one segment. It means developing:

- *Adaptable, flexible manufacturing* to support customization and a wider range of product configurations
- *Lean supply chains* to improve time to customer
- *Autonomous drive hardware and software* and advanced electrical vehicle architecture and components
- *Customer-centric retailing* that links customers to product design and manufacturing[16]

Enabling the in-vehicle transit experience

The **in-vehicle transit experience** will increasingly be a defining feature of the future of mobility. In the United States, drivers spend roughly 160 million hours annually traveling from point A to B.[17] That's 46 minutes per person, every day. As shared and autonomous mobility proliferate, a tremendous opportunity arises for companies seeking to sell

content, entertain, and generally enhance the time spent in-transit. Roughly 20 percent of UK consumers' online shopping, for example, already occurs during commutes.[18]

"Experience enablers"—content providers, in-vehicle service providers, data and analytics companies, advertisers, entertainment equipment providers, and social media companies—will clamor to make the in-transit experience whatever we want it to be: relaxing, productive, or entertaining. We are already seeing signs of the imminent war for travelers' attention. Volvo announced a partnership with Netflix in January 2016 to enable livestreaming while in commute.[19] Several automakers have struck deals with content providers to stream audio to vehicles, which could readily extend to video, Web browsing, and other even more advanced content.[20] Augmented-reality windshields, currently being explored as a safety and navigation aid for drivers, could easily be repurposed for a hands-free world.[21]

Many of the capabilities in this space already exist but will be vastly expanded to become even more immersive and interactive: high-quality content creation, effective content sourcing, targeted advertising, and product placement. New needs will emerge as data and analytics support not only entertainment but a broader set of experiences.

Content creation will likely remain central, and as vehicle interiors adapt to a driverless world, new possibilities will emerge to develop immersive and interactive videos, music, and games. In March 2016, Ford patented an "Autonomous Vehicle Entertainment System," in which the entire windshield becomes a display for entertainment purposes.[22] It is increasingly plausible that the entirety of the cabin's walls and ceiling could become high-definition touchscreens, perhaps incorporating augmented-reality technologies. The most successful experience providers will capitalize not only the time spent in the vehicle but the myriad unique ways customers can consume content. Today's content and experience leaders may have significant opportunities for growth, as do owners who want to curate branded experiences.

As shared and autonomous mobility proliferate, a tremendous opportunity arises for companies seeking to sell content, entertain, and generally enhance the time spent in-transit.

In-vehicle services could also expand, from meals to shopping and beyond. Today we are seeing the first forays into on-demand food delivery operated independently of restaurants.[23] Tomorrow that service could be extended to the vehicle itself for journeys of sufficient duration—think of Ben's frictionless pizza and grocery deliveries.

Predictive content analytics will likely be essential to maximizing the in-vehicle experience, collaborating with mobility managers (see below) to provide content seamlessly and intuitively to assist passengers with where they are going, how they get there, and what they do along the way. Doing so means tailoring content suggestions based not only on a user's history—as today's recommendation systems do—but also with ever-more comprehensive information about the specifics of a trip, entertainment and productivity patterns, and social interactions. Platforms and data will be the lifeblood of this new system.

Infrastructure enablers

The safe and efficient movement of people and goods hinges critically on underlying infrastructure, a fact that will be just as true tomorrow as it

The goal: Seamlessly and intuitively assist passengers with where they are going, how they get there, and what they do along the way.

is today. Accordingly, the important role played by providers of both *physical infrastructure* and *energy infrastructure* will persist. Transit stations, roads, highways, waterways, and public parking will become even more interconnected as customers increasingly expect multimodal transportation. That means providing:

Smart tolling and dynamic road usage pricing, which will likely emerge built not only on supply and demand but also road type (primary versus arterial), the number of affected passengers, environmental impacts, and infrastructure wear and tear. Such systems will help cover the real cost for the use of the infrastructure while aiding route optimization and flow and helping to offset potential declines in revenues from other sources (like traffic fines, gas taxes, and parking fees).[24]

Traffic flow management informed by real-time data and analytics of congestion, weather, and other variables, which many cities are already implementing.[25]

Energy providers and retailers will likely need to integrate into the existing infrastructure to ensure that the overall fleet—which could comprise many more electric and hydrogen fuel cell-powered vehicles—can travel effectively. That demands close management of an increasingly complex end-to-end supply chain, including battery recharging and replacement.

In addition to these physical assets, a parallel *digital infrastructure* will emerge that will be every bit as critical as roads and bridges. As data becomes the new oil, companies—including providers of telecommunications, cybersecurity, and operating systems—can capture value by providing fast, safe, reliable, and ubiquitous connectivity for all the data that the future mobility ecosystem requires.

Already, telecommunication giants are experimenting with ways to monetize connected car technologies. Verizon is one of 15 companies working with the University of Michigan to test driverless cars, focusing specifically on how autonomous vehicles will communicate with other vehicles, pedestrians, bicycles, and the surrounding infrastructure.[26] AT&T connected more than one million cars in late 2015, more than any other wireless category, including smartphones.[27] Both companies are exploring alternative revenue models: AT&T is bundling cars as an additional device to the shared data pool, whereas Verizon is experimenting with pay-per-app models.[28] And we are already seeing partnerships between telecommunications providers, and automotive manufacturers, and mobility management services. To facilitate its partnership with Netflix, Volvo partnered with Swedish telecommunications provider Ericsson to build smarter streaming technologies specifically for autonomous vehicles.[29]

To succeed as digital infrastructure providers, companies can look to offer:

Seamless connectivity that keeps customers online regardless of time, location, or mode of travel, and that can accommodate the surge in data that will accompany the proliferation of connected, shared, and autonomous vehicles and seamless intermodal transportation. That could mean smart metering and surge pricing to avoid, for example, localized connection outages in areas of heavy traffic.[30]

A **horizontal operating system** that is "shared by all participants across the ecosystem rather than

being unique to each vertical stack of technology."[31] That means the ability to bridge not only vehicles but also mobile devices and Internet of Things architectures—in many ways, a prerequisite for the vision of seamless, intermodal mobility.

Network security that safeguards customer data and the overall mobility system. As connected vehicles yield ever more detailed information about where and how we go, when, and with whom, protecting data will become *sine qua non*.[32] And keeping autonomous vehicles safe from the range of potential cyber threats, from the merely inconvenient to the life-threatening, will be key to realizing the future of mobility.

Mobility management

Today, ride-hailing companies act as network orchestrators, connecting people requiring a service with those offering that service. Along with automotive OEMs, however, these companies are pursuing a more integrated set of mobility options and services. Uber is expanding its connections with lenders, payment providers, and credit card companies, investing in its own mapping capabilities, and integrating with major business software applications.[33] GM has invested $500 million in Lyft and acquired Maven, a carsharing platform.[34] In April 2016, Ford launched FordPass, an app and platform that aims to be a one-stop mobility marketplace encompassing vehicle control, vehicle sharing, parking reservations, in-vehicle entertainment options, and even live chats with customer assistants.[35] Similarly, Daimler's North American expansion of Moovel—which enables route planning, booking, and payment across multiple modes of transit—reflects the company's ambition to create a network of "interoperable products built for transit agencies, app developers, and end consumers."[36]

These efforts are tangible demonstrations of the future of *mobility management*.[37] As providers begin to set up infrastructure, autonomous technologies are tested and proven, and the in-vehicle experience improves, we are seeing indications that an integrator will emerge to connect autonomous vehicles and other modes of transit to the end consumer. Fully realized mobility advisers will look to enable a seamless intermodal transportation experience, ensuring easy access, exemplary in-transit experience, a smooth payment process, and overall customer satisfaction. They will take into consideration customer preference, traffic data, and other circumstances to arrive at the most convenient and cost-effective mobility plan—whether that entails a shared car, a train, a bike, or all of them.

We see both customer-facing and asset-owning dimensions to mobility management, and while the two roles are distinct, in practice a company could fill both of them simultaneously. The mobility adviser directly interfaces with the customer, who will expect a customized experience that relies on the mobility assistant's ability to execute trip planning, adjust routes to allow for traffic and disruptions, and handle payments. A variety of technology companies that collect consumer business data (e.g., venue information and activity information) will work with the mobility managers and end consumer businesses to enhance the user's experience. Social networks will further enhance the user experience by suggesting consumer preferences to shape the journey. And navigation providers will look to optimize routes using prime data from environment and weather companies. For the company at the center of it all, that means developing:

Mobility data collection to enable tailored route suggestions, including the ability to store and access vast amounts of information safely and reliably. Sensors can collect information on everything from intersection status and traffic jams to travel time measurement and CO2 emissions. Value to the user will likely come through the integration of this information into smarter route suggestions.

Predictive analytics to match user preferences with travel recommendations. Mining vast quantities of real-time data on the environment as well as user habits will help orchestrate a seamless flow across the ecosystem.

User control, including design and deployment of intuitive customer interfaces, although the proliferation of apps may find this capability dispersed among the users themselves.

Relationship management capabilities to acquire and retain customers. Because network effects will likely play an important role in mobility managers' success, extensive and early user buy-in and adoption will be essential.[38] This makes sales and marketing teams critical for building the platform.

Because shared autonomous vehicles will likely play a critical role in the future mobility landscape, especially in cities, fleet operation is a second opportunity to create value around mobility management.

Fleet operators will deploy a range of vehicles matched to users' preferences, managing their upkeep and storage, and leverage enhanced smart routing capabilities to match supply and demand effectively. Doing so successfully requires:

Procurement capabilities, including contract management

Vehicle tracking to enable real-time monitoring of the fleet. Companies offer software showing vehicle location, fuel usage, speed, mileage, and other information in real time, making it easier for fleet companies to match vehicles to users[39]

Finance and insurance, working with partners in those industries

Setup, scheduling, and allocation of vehicles throughout the service area, including the ability to reconfigure a vehicle's entertainment and other options remotely as it moves from one fare to another

The roles and capabilities described here are illustrative, not exhaustive, but many players will vie for these new opportunities. Winning in many cases will require significant transformation of their business system and operating model. While some stakeholders may find themselves naturally well positioned for certain opportunity spaces or value capture strategies, others will find themselves at a disadvantage. The future need not take companies by surprise, however. The key lies in understanding your capabilities against the emerging needs of the ecosystem to decide "where to play" and "how to win."[42]

SUPPORTING ECOSYSTEMS

There are multiple additional roles that are essential for keeping the mobility ecosystem running smoothly but that are beyond this article's scope. Finance, insurance, and payment providers will likely see dramatic shifts to their business and the emergence of new products and services to meet changing customer demands. Auto finance will increasingly become a business-to-business interaction with the purchasers of large shared fleets.[40] As vehicles become safer, insurance policies will likely shift to focus on per-trip coverage for riders and product liability policies to cover autonomous vehicles' hardware and software.[41] Payments providers will likely support in-vehicle purchases, linking accounts directly to consumers and offering the ability to pay once for a single journey.

Governments will also likely play a critical role, both by setting regulation and by serving as a "conductor" of sorts, enabling the ecosystem's constituent pieces to work seamlessly together. City and regional managers will work with other enabling entities to ensure public infrastructure is maintained (see "infrastructure enablers" above).

Building a strategy for the future of mobility

DEPENDING on your perspective, the changes discussed here—shared mobility, autonomous vehicles, seamless intermodal transit—may seem thrilling or daunting. Much has happened in just the past year, and we expect even more to occur in the coming one. Any actor involved in the movement of people and goods should begin identifying *now* where it wants to play in the new mobility ecosystem.

Evaluate the potential impact: Each player should analyze how and by how much the future of mobility will impact their current business or operations. The magnitude of the transformation is likely sizeable, the velocity of change is rapid, and businesses and governments will have to operate in a multistate, multimodal future that demands flexibility and adaptability. While the change may seem distant, the timeframe for adoption could shrink surprisingly quickly. An analysis will give management a more empirical understanding and help build consensus around the degree of urgency required to make the transition to the new mobility ecosystem.

Determine which role or roles you aspire to in the new mobility ecosystem: While change is imminent, new opportunities will continue to emerge and expand. Amidst the ecosystem's complexity, we anticipate the emergence of distinct value creation roles. These roles are closely linked and will require collaboration to serve the customer. The car-centric extended automotive industry has become a customer-centric mobility ecosystem, where the focus is on the experience of moving from point A to point B—rather than the physical vehicle itself.

Assess how your current capabilities match those required for future success: Not all opportunities are created equal. Stakeholders must carefully examine their own capabilities against those required to succeed in their chosen role. This paper only scratches the surface of the opportunity spaces. In reality, there are a host of players and capabilities that will support and enable the ecosystem.

Evaluate competitive intensity, and be clear-eyed about how you stack up against incumbents in that space: You will not be alone in seeking to capture value in the new mobility ecosystem. Many players—both incumbents and disrupters—are already making moves to play.

Develop a roadmap to build the needed capabilities: Enterprise transformation rarely happens overnight and takes time and planning. Understanding the broader ecosystem and the required capabilities will help companies and governments better lay out their path to success, whether that be through acquisition, partnership, or internal development. Part of this journey will require making hard decisions around your winning aspiration.

Change is coming soon—and the extended automotive industry will have to rapidly adjust to rising consumer expectations. As elements of the new mo-

bility ecosystem emerge, from carsharing apps to self-driving vehicles, it's hard *not* to speculate how advanced transportation technology might change. Many will likely find a vision of being seamlessly picked up after work, entertained in comfort on the way home by a system that already knows your preferences and needs, and efficiently dropped off at your front door very appealing.

Making this scenario a reality—much less making it as smooth as it needs to be for broad adoption—will demand new thinking, competencies, and coordination. In the new mobility ecosystem, value creation opportunities will likely require stakeholders to rethink their business models. Depending on an organization's role in the ecosystem, leaders will need to determine whether existing capabilities allow them to deliver the value customers demand—and if not, how to build new strengths.

Appendix

We use a range of data to calculate the impact of the four future states on miles travelled and unit sales:

For miles traveled in rural and urban areas: "Highway statistics," US Department of Transportation Federal Highway Administration, www.fhwa.dot.gov/policyinformation/statistics.cfm.

Since data on urban areas includes suburban areas, we follow economist Jed Kolko's methodology to back out the suburban share: Kolko, "How suburban are big American cities?", FiveThirtyEight, May 21, 2015, http://fivethirtyeight.com/features/how-suburban-are-big-american-cities/.

For shared vehicle data, we use a combination of data on the size of the rental car fleet and vehicle usage in miles used to calculate annual miles driven by rental cars: *Auto Rental News*, "2015 U.S. car rental market," *Fact Book 2016*, page 8, www.autorentalnews.com/fileviewer/2229.aspx; Scott McCartney, "Rental cars with higher mileage populate lots," *Wall Street Journal*, August 28, 2013, www.wsj.com/articles/SB10001424127887324463604579040870991145200.

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