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60
70
50
80
40
90
30
72%
5.6
miles to
destination
20
100
Self-driving
MODE ON
10
110
0
120

P R N **D**

Express lane ahead

Finding new roads to value
creation as the automotive
industry transforms

Deloitte.
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Like the augmented reality experience on page 9? Visit www.deloitte.com/insights/ picture-mobility for more AR-enhanced insights in *Picturing how advanced technologies are reshaping mobility*.

Tempering the utopian vision of the mobility revolution

As global consumers start to critically evaluate advanced vehicle technologies and whether they are willing to pay for them, utopian visions of future mobility systems may not be as close as we thought, leaving OEMs in the precarious position of needing to push forward on costly R&D programs with little assurance of ROI.

By Craig A. Giffi, Joseph Vitale Jr., and Ryan Robinson

Most scenarios involving future transportation systems center on the hyper-optimistic view that everyone will take full advantage of integrated, electrified, shared mobility networks that have unfettered the ordinary consumer from the bonds of fossil fuels and personal vehicle ownership. The benefits of this potential future are undeniable, and giving people an idea of what transportation could be like is important. Yet there are still many hurdles to clear. And perhaps one of the most important, yet often overlooked, is the question of consumer adoption. What proportion of people, for instance, will actually buy an autonomous vehicle (AV) or use shared transportation? Will this proportion

be enough to transform mobility on a large scale? Is it possible that such technologies and behaviors will remain niche phenomena in a future that looks more or less the same as today?

In this article, we look at four automotive trends that are foundational to the future of mobility—vehicle autonomy, electrification, connectivity, and shared transportation—through a global consumer lens using results from the 2019 Deloitte Global Automotive Consumer Study. Our overall take-away: Significant challenges remain that may be overlooked by industry players so focused on developing the technology that they forget to ask whether anyone will use it.

Global consumers appear to be pumping the brakes on AVs

One of last year's most interesting study findings was a general warming toward the concept of self-driving vehicles, signaled by a precipitous drop in the percentage of consumers that believe that AVs will be unsafe. This was attributed, in part, to people's increasing exposure to a variety of AV initiatives and real-world pilots via broad media campaigns.

However, in this year's study, something quite unexpected happened. Rather than decreasing further, the percentage of people viewing AVs as unsafe has all but completely stalled in virtually every market around the world (figure 1).

The obvious question: What caused the strong positive momentum toward perceived self-driving vehicle safety to evaporate? The answer could be rooted in the very same media that captured consumers' attention in the first place. Widespread coverage of even the very small number of accidents

involving AVs may be shaping public perception, with nearly two-thirds of consumers in Republic of Korea, the United States, India, and China agreeing that media reports of accidents involving AVs have made them more cautious of the technology.

Consumers also want governments to up their regulation game: An overwhelming percentage of consumers in most countries indicated they wanted "significant oversight." In fact, consumer trust in traditional original equipment manufacturers (OEMs) bringing AV technology to market continues to slip. Even in Germany, where trust in OEMs has traditionally been fairly solid, this proportion has dropped to 33 percent from 51 percent in 2017. This may be due, in part, to the black eye German automakers suffered in the wake of the "dieselgate" scandal.

Our study results reveal that people are turning to existing technology companies, perhaps because of exactly these reasons. This trend is troublesome for automakers making enormous investments to develop AV features, and fortuitous for new industry

FIGURE 1

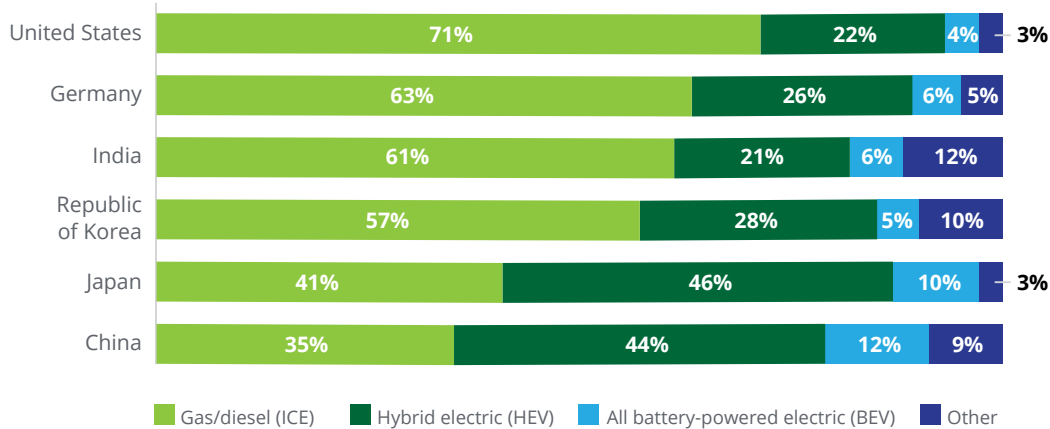## Consumers' safety perceptions of AVs remain largely unchanged since last year

Percentage of consumers who agree that AVs will not be safe
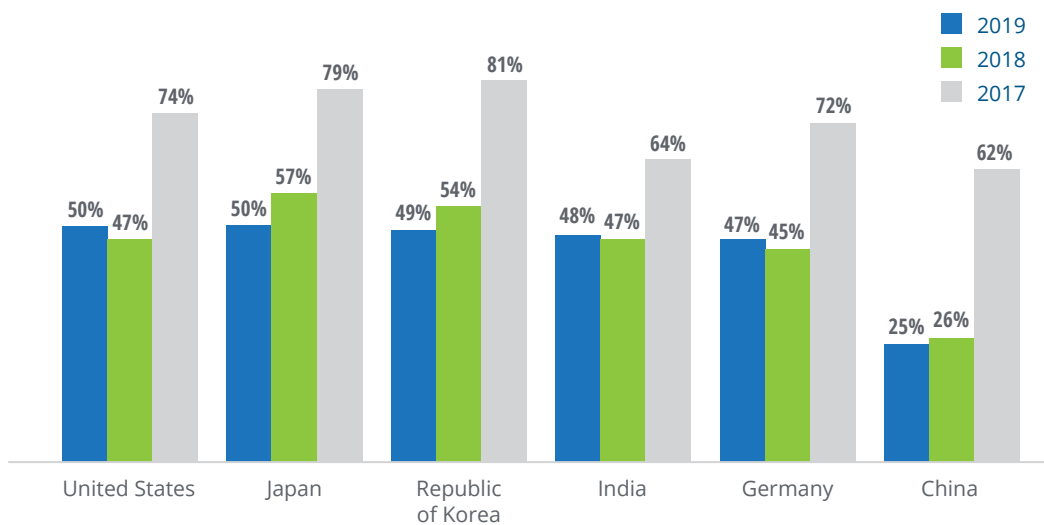
Source: Deloitte Global Automotive Consumer Study.

FIGURE 2

Many consumers are willing to consider an electrified powertrain for their next vehicle

	Gas/diesel (ICE)	Hybrid electric (HEV)	All battery-powered electric (BEV)	Other
United States	71%	22%	4%	3%
Germany	63%	26%	6%	5%
India	61%	21%	6%	12%
Republic of Korea	57%	28%	5%	10%
Japan	41%	46%	10%	3%
China	35%	44%	12%	9%

Gas/diesel (ICE)   Hybrid electric (HEV)   All battery-powered electric (BEV)   Other

Source: 2019 Deloitte Global Automotive Consumer Study.

entrants that are looking to disrupt the mobility space. Indeed, government standard-setting for, say, data communication and programming outcomes could change consumer perception and help the AV industry.

Electrification could make a more immediate impact on global mobility

Study results indicate that many consumers are considering an electrified powertrain as a viable option for their next vehicle (figure 2). However, even though global growth in electrified vehicles (EVs) is expected, it will likely play out somewhat differently depending on the market.[1]

- China is strengthening its policy ecosystem to drive EV growth to address domestic pollution concerns, reduce its reliance on imported oil, and stake a claim to leadership in the next era of global mobility.

- The share of diesel vehicles in the EU-15 region declined from a high of 56 percent in 2011 to 45 percent in 2017.[2] More recently, diesel share in the European Union fell sharply to 37 percent in the first half of 2018 from 43 percent in the first half of 2017.[3] Some European countries, including Norway, Britain, France, and the Netherlands, have even announced plans to ban the sale of conventional gas- and diesel-fueled vehicles over the next two to three decades.

- EV adoption in North America is likely to lag due to a low-fuel-price environment, relaxed emissions standards, and a tighter tax-rebate policy.

Even if one accepts the most optimistic forecast for global EV sales over the next decade, this number is still a drop in the bucket compared to the more than 1.2 billion fossil-fueled vehicles currently on the road.[4] With a life expectancy of more than 10 years, these traditional vehicles will likely remain the dominant automobile type for some time to come. In addition, our study results indicate that

consumers in most countries remain hung up on (increasingly unfounded) concerns about battery-electric vehicle (BEV) range, charging time, and safety. Instead, people are looking to hybrid electric vehicles (HEVs) as the interim answer. Interest in HEVs in Japan, for instance, grew from 38 percent of consumers in last year's study to 46 percent this year.[5]

Getting consumers to pay for increased connectivity could be a challenge

Industry estimates suggest that worldwide sales of connected cars will reach 72.5 million units in 2023, up from just 24 million units in 2015.[6] However, consumers in different markets perceive the benefits of increased vehicle connectivity differently. For example, twice as many people in China and India than in Japan and Germany agreed that increased connectivity will lead to substantial benefits. However, less than half of surveyed US consumers (47 percent) were bought into the idea.

Part of what may be driving concerns about vehicle connectivity is the increasing number and type of sensors to track everything from powertrain performance and operational statistics to geolocation information and occupant wellness. Not all types of data collection are getting a full endorsement from consumers. Sixty-three percent of people in the United States are concerned about biometric data being captured and shared with external parties; 40 percent of people in China and Japan say the same. Nonetheless, interest in connected features such as traffic congestion tracking and road-safety alerts is universally high, which strongly aligns with the most important aspect of mobility for at least one-third of consumers, which is getting to their destination in the least amount of time.

Are consumers willing to pay to gain access to advanced connected vehicle features? The answer is a resounding "maybe." In Germany, 43 percent of consumers said they would not pay any more for a connected vehicle, and another 40 percent said they

would only pay up to €600 more. A similar story plays out in the United States, where one-third of consumers would not pay more and another 42 percent would only pay up to US$500 more. And although a far greater proportion of consumers in Japan (72 percent) would pay more, their upper limit was only ¥50,000 (approximately US$450). Indian (50 percent) and Chinese (43 percent) consumers were willing to pay more than ₹25,000 and CN¥2,500, respectively (roughly US$350).

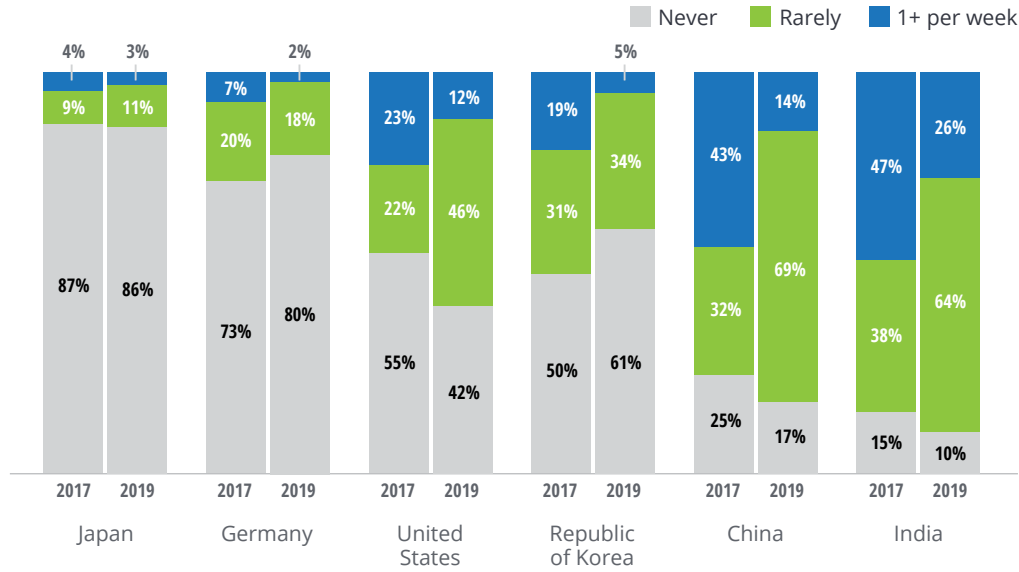## The mobility revolution is running up against entrenched consumer behavior

There are a few "immutable truths" about consumer behavior: (1) Consumers are unwilling to compromise, (2) their usage patterns are difficult to change, and (3) they don't like sharing. For example, study results indicate that 56 percent of Americans are not interested in carpooling services, and German consumers prefer to use their vehicle daily (47 percent of consumers now and 46 percent three years from now). Finally, multimodal transfers in one trip are largely an occasional undertaking for most: 39 percent of US consumers say they never combine different modes in a single trip, and while one-third of Japanese consumers say they do so at least once per week, another 58 percent indicate that this is an ad-hoc occurrence.

Even ride-hailing, which is often held up as the epitome of the new mobility-as-a-service (MaaS) transportation model, has experienced an interesting transformation over the last few years (figure 3). In 2017, 23 percent of US consumers used ridehailing at least once a week, and another 22 percent used it occasionally. Fast-forward to 2019 study results, and the percentage of regular users has halved, while the proportion of occasional users has increased twofold. China and India are no different. This could be worrisome to both established and emerging ride-hailing brands, as the window of opportunity to create a dominant market position is likely rapidly closing as traditional competitors

FIGURE 3

Ride-hailing is changing from a regular to an ad-hoc behavior

Frequency of ride-hailing usage

Legend: ■ Never   ■ Rarely   ■ 1+ per week

	Japan 2017	Japan 2019	Germany 2017	Germany 2019	United States 2017	United States 2019	Republic of Korea 2017	Republic of Korea 2019	China 2017	China 2019	India 2017	India 2019
1+ per week	4%	3%		2%	23%	12%		5%	43%	14%	47%	26%
Rarely	9%	11%	7%	18%	22%	46%	19%	34%	32%	69%	38%	64%
Never	87%	86%	20% / 73%	80%	55%	42%	31% / 50%	61%	25%	17%	15%	10%

Note: Germany 2017 shows 7% (1+ per week), 20% (Rarely), 73% (Never). Republic of Korea 2017 shows 19% (1+ per week), 31% (Rarely), 50% (Never).

Source: 2019 Deloitte Global Automotive Consumer Study.

race to catch up on the consumer interface and integrated payment fronts.

Addressing these issues could be fairly simple, however, if OEMs and other new mobility players are able to maintain current levels of investment in developing MaaS models. Study results indicate that not only are younger consumers more interested in using new mobility services than older people, but a greater percentage of them also wonder whether they need to own a vehicle. Focusing on younger consumers to get them to try new, integrated transportation solutions more often may be the key to cementing that behavior until it just becomes the way mobility works.

Companies across the global automotive ecosystem could do well to carefully consider the following points:

• Given that consumer interest in AVs has stalled, governments should provide regulatory leadership. Establishing critical standards for AV development and use could address safety concerns, and it may also help the industry converge

on technology solutions while reducing the cost of regulatory compliance.

• Interest in vehicle electrification is growing, but it will likely take several decades before a wholesale global transformation occurs. A strong government push to encourage EV adoption through strict environmental controls and attractive tax incentives can help EVs find a solid foothold in many markets.

• Consumers may not be prepared to properly compensate OEMs for enhanced connected capabilities, given widespread concerns regarding data security and cost.

• Pushing forward with new visions of integrated mobility systems means tackling some basic human behavior patterns. Encouraging younger consumers to embed new mobility behaviors into their daily routines may be the only way to get to an integrated, electrified, shared future of mobility, assuming industry players can hold out long enough for that transformation to take place.
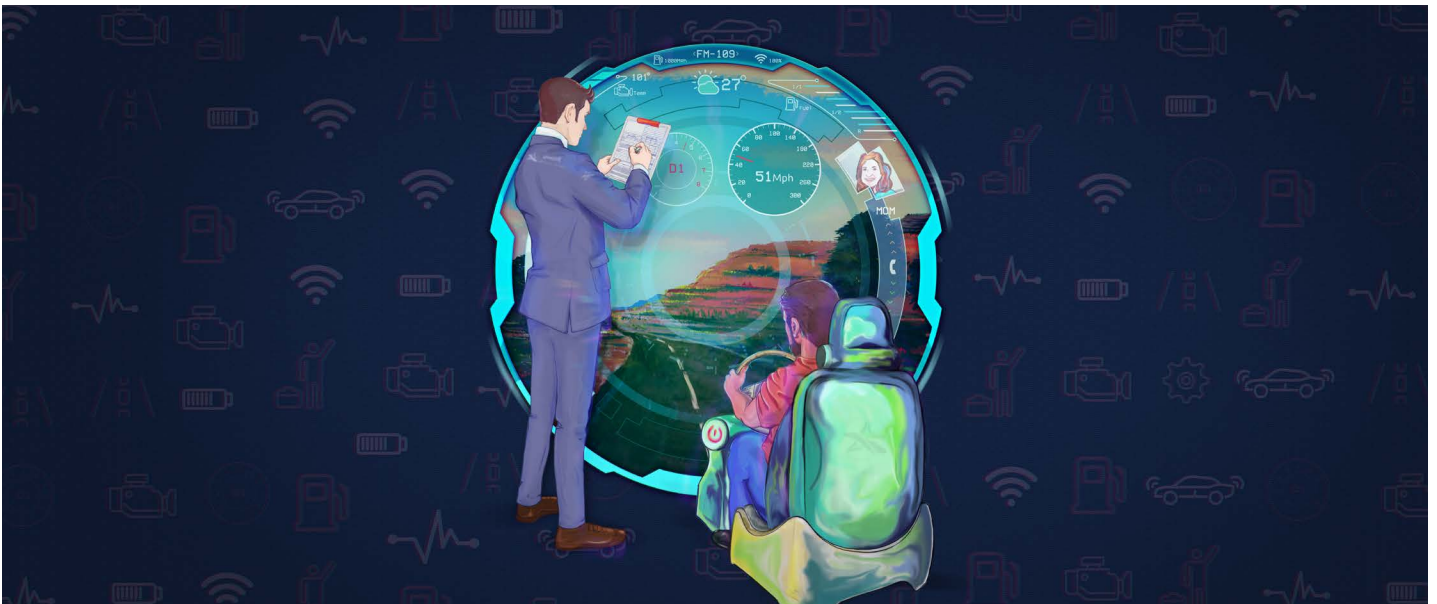
How digital technologies can elevate the car-buying experience

Digital technologies are starting to fundamentally change the way people buy cars, but manufacturers and dealers should think carefully about where to invest in order to elevate the customer experience.

By Dan Bolger, Christopher De Santis, Ethan Forchette, Srinivasa Reddy Tummalapalli, and Ryan Robinson

Some of the best experiences people have in their lives are those that are customized and connected to them on a personal level. These days, people increasingly expect to have such experiences across all of their brand interactions, whether it's paying for coffee, ordering groceries online, booking travel, or buying a car.

One way that companies are meeting this challenge is by integrating advanced digital technologies into the buying process—and automotive companies are no exception. Many automotive manufacturers and dealers in the United States are making significant investments in a variety of consumer-focused digital technologies, ranging from tablet-based product guides to virtual reality (VR)-enabled applications with an eye to increasing customer engagement on the showroom floor. The intent is to update and improve a sales process that has not changed for the better part of a century. But which digital investments will yield the most significant returns?

This question is the more difficult because manufacturers and dealers differ in the outcomes they need from digital transformation at the retail level. Generally, manufacturers are looking to large digital investments to drive overall mobility strategies aimed at reshaping the way consumers engage with their brand. On the other hand, dealers are typically pursuing much more immediate digital solutions to drive operational efficiencies, reduce overhead, empower sales staff, and increase transparency while reducing friction in the sales process.

Whereas manufacturers are investing to create omni-channel customer experiences, dealers are more focused on tactical solutions that integrate disparate data systems to ease information flow across the dealership.

This lack of common ground often leads to disagreement between manufacturers and dealers on the best approach to digital implementation. However, our experience suggests that both parties could benefit from thinking more collectively about digital transformation, particularly in the "upper-to-mid funnel" where consumers are still researching a potential purchase online. Results from the 2018 Deloitte Global Automotive Consumer Study indicate that, out of all sources of information, brand and dealer websites have the greatest impact on new car-buying decisions (tied with input from family, friends, and coworkers). The importance of identifying, intercepting, and influencing potential buyers online is underscored by the fact that half of US auto buyers do not engage in any dealer cross-shopping after they first visit a showroom. Indeed, 30 percent buy a vehicle the very same day they step onto a dealer's lot. Being top of mind when people first head out to kick some tires can thus significantly increase the odds of a sale.

But creating a truly engaging online experience that compels people to visit a physical retail location can be harder than it looks. Many dealers complain that manufacturers exert too much control over their online presence by using standard website templates, while manufacturers are frustrated by the wide variety of dealer management systems (DMS) applications among dealers that ultimately waters down their vision for a seamless, integrated Web experience. Perhaps as a result, study results show that more than half of all auto shoppers find manufacturer and dealer websites to be merely meeting expectations.

The good news is that ample opportunity exists for brands and dealers to create a differentiated digital experience via their websites, potentially adapting useful ideas from sectors such as consumer electronics and online retailing. Building a strong bridge that facilitates a seamless move from online research to a physical shopping experience can be an especially important goal. For example, making sure any information and preferences people input online follow them into the dealership can significantly streamline the salesperson's discovery process. Also, keeping critical information, such as vehicle pricing, consistent between the Web and the dealer's showroom could enhance the buyer's experience by improving his or her perception of dealer transparency and integrity.

A compelling argument also exists for digital investments that directly address customer pain points in the vehicle-buying process. Study results confirm the long-standing notion that people dislike excessive paperwork and the overall length of time it takes to buy a car. Digital tools that streamline these processes, such as used vehicle valuation algorithms and remote document "e-signing" capabilities,[1] can elevate the overall shopping experience. They may even increase the likelihood of a sale by reducing the amount of time customers are exposed to anxiety-inducing aspects of the purchase process. And they can also provide the necessary conditions for effectively transitioning the customer into a long-term service relationship.

Companies should also recognize that many people shopping for their next vehicle have yet to fully embrace digital sales aids as the primary means of researching a purchase. Study findings show that vehicle shoppers across all generations prefer more "low-tech" information tools while they are in a dealer showroom. In fact, 80 percent of US vehicle buyers rate conversations with salespeople as the most useful information channel, followed by printed brochures and spec sheets. This preference for "traditional" information tools could be attributed to a number of factors, including a consumer base that does not yet fully understand or appreciate the types and benefits of enhanced user experiences these technologies can create. This suggests that good customer handling fundamentals are still the foundation of a truly exceptional customer experience, which can then be enhanced by the judicious use of digital sales aids that increase convenience, transparency, and flexibility.

That's not to say that *no one* is interested in digital enhancements to the showroom experience. Millennials and younger buyers, according to our study, are open to such experiences—but they ultimately favor their own mobile devices to access the information they need. Premium car brand owners, too, show higher-than-average interest in digital showrooms: Nearly one-third (31 percent) find tablet devices to be helpful while shopping at a vehicle dealer, compared to only 21 percent of non-premium car owners.

Notably, our study found that 60 percent of US consumers are at least "interested" in the overall concept of buying their next vehicle online directly from a manufacturer. This should be a wake-up call for auto dealers that the expectation of a completely digital buying experience could be closer than they think. For their part, rather than trying to go around the dealer (which would likely involve a long and painful legal process), manufacturers could see this as a golden opportunity to work with dealers to explore what a wholly virtual sales process could look like. For example, giving salespeople digital tools and moving them out of the dealership to interact with customers where they live or work could significantly improve the sales experience by increasing the perception of convenience while reducing anxiety.

That said, it's unlikely that in-person sales will ever disappear entirely, as several important aspects of the showroom experience can be hard to "digitize." For example, our survey shows that nearly nine out of 10 shoppers prefer the immediate, tactile experience of physically interacting with a vehicle before buying it, while 70 percent of buyers indicate they prefer in-person interactions with dealership personnel. And nearly two-thirds of buyers say they would rather conduct price negotiations in person to secure the best deal. These preferences imply that most auto buyers have yet to envision a fully digital vehicle-purchasing experience—and may also help explain why the wave of online shopping that is taking over many retail subsectors has yet to fully disrupt the automotive retail industry.
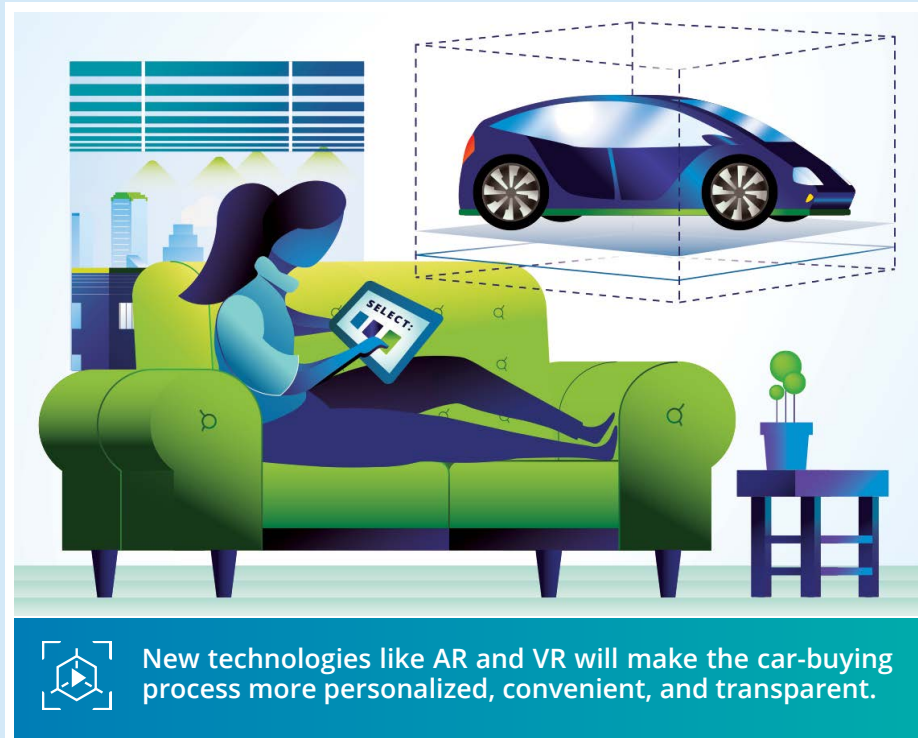
Manufacturers and dealers seeking to invest in customer-focused digital capabilities may wish to consider the following:[2]

1. Engage potential buyers during the online research phase with targeted, tailored messaging. Retain any data collected during the online research phase to help create a seamless, tailored experience at the dealership.

2. Leverage related online capabilities, such as financing preapprovals and finance protection product explanations, to increase transparency and accelerate the car-buying transaction. Create horizontal data aggregation capabilities that integrate information across dealer systems to reduce friction in the vehicle-purchasing process.

3. Expand the pool of available customer data points by exploring strategic partnerships with mobile device providers, social networks, application developers, location-based service providers, and network services that are already seeking to position themselves as integration hubs for an individual's mobility profile.

4. Develop pricing strategies that engage the customer as a partner, with systems offering price match guarantees that encourage future loyalty to both the dealer and the brand.

5. Don't let the dealership be defined by the walls that hold up the roof. Potential customers are everywhere. The flexibility to engage with customers on their own terms in an office, home, or coffee house with video chat or AR/VR can be integral to auto retailing going forward.

In an industry where competition for consumer attention is likely to intensify in the face of softening overall demand,[3] the need to embrace new technologies to improve the car-buying experience seems critical. However, digital transformation can mean a variety of things, and investments should be prioritized in the areas where customers see the most value.

Changing how people shop for cars

By Craig Giffi, Dan Littmann, Kevin Westcott, and Steve Schmith

New technologies like AR and VR will make the car-buying process more personalized, convenient, and transparent.

This illustration is enabled with augmented reality technology. **Search for Deloitte Digital Reality in your favorite app store to download and install the Digital Reality DxR app on your mobile device.** To activate your AR-enabled journey, open the DxR app and place your device's camera over the illustration.

Shopping for a car isn't something many consumers look forward to. Yet, according to Deloitte's Global Automotive Consumer Study, consumers view the customer experience and their relationship with salespeople as integral to their final purchase decision. In fact, consumers around the world rank family, friends, and salespeople as the top sources for information when shopping for a vehicle.

So what do consumers dislike most about the process? Too much paperwork and an overall purchasing experience that just takes too much of their time. In addition, our research shows consumers are increasingly interested in buying a vehicle online without ever having to set foot inside of a dealership.

Advancements in VR technologies are poised to help both automakers and automotive dealers alleviate many of the pain points commonly associated with buying a vehicle. It also promises to create opportunities to engage consumers in entirely new ways while improving operations and the bottom line. Within the next three years, we anticipate significant growth in the use of VR technologies that allow consumers to compare models, build a vehicle and choose its features, and "test drive" it, then finance their purchase wherever and whenever they choose. That could include at shopping centers, airports, concerts, sporting events, and other attractions, as automakers and dealers create "pop-up" dealerships—VR-enabled kiosks that go where consumers are rather than requiring them to come to showrooms.

Building a driverless future

An executive interview with GM's Mandi Damman

By Darrin Kelley, Steve Schmith, and Ryan Robinson

A driverless future beckons car companies to build the most effective and efficient autonomous cars. GM's Mandi Damman speaks about creating environment-friendly autonomous cars, integrating cross-functional teams to succeed together, and what it means to be a woman in the automotive ecosystem.

Companies across a vast and expanding automotive ecosystem are racing toward a future of mobility in which autonomous vehicles figure prominently, potentially delivering highly touted benefits such as increased safety, less congestion, and reduced pollution. Still, the road to that future is long and filled with twists, turns, and unforeseen bumps. Automotive manufacturers are at the center of a global effort to create, test, and prove that autonomous technology can truly deliver the promised benefits.

General Motors (GM) is investing billions of dollars in its endeavor to build a driverless future.

Guided by the company's vision of zero crashes, zero emissions, and zero congestion, GM has announced plans to begin launching self-driving vehicles at scale in 2019,[1] and add more than 20 electric vehicles to its product lineup by 2023.[2]

We sat down with Mandi Damman, GM's chief engineer of autonomous vehicles, to discuss the journey to autonomous mobility. She shares her perspectives on challenges facing all automakers, GM's innovations in autonomous vehicles, and the work she is doing to encourage young people to explore careers in engineering.

DELOITTE: General Motors' CEO, Mary Barra, has expressed her vision to create a future with zero crashes, zero emissions, and zero congestion. What is your role in supporting that vision through the autonomous drive development program you lead at GM?

MANDI DAMMAN: The work we're doing on the Autonomous Vehicle team touches each one of those pillars. Ninety percent of traffic-related accidents are caused by human error, so autonomous vehicles have the opportunity to make our roadways much safer—they don't drive distracted, they don't drive tired, and they don't drive drunk. So we know that the work we're doing can make our roadways significantly safer, and we're committed to doing that.

At GM, we believe that autonomous vehicles should be electric vehicles, so we built our program off the zero-emissions Bolt EV platform, which is ideal for this application. In terms of zero congestion, deploying the first autonomous vehicles in a rideshare environment allows us to adjust the times when vehicles are on the road. When the cars aren't transporting rideshare passengers, we can use them to deliver packages in the middle of the night to completely change the way mobility works. This is something that we're doing to move humanity forward, and on the Autonomous Vehicles Program team, we have a huge role in doing just that.

DELOITTE: How do you engage the consumer on the concept of autonomous vehicles? How are you getting them to buy into the vision?

MD: We're keeping the customer at the center of everything we do. We have started to communicate our approach to developing AVs safely, including a self-driving safety report that goes into detail on our technologies, our systems, and our product integrity. We're committed to bringing the consumer with us on this technology journey. Ours isn't like a typical vehicle program where you keep all your

secrets and then one day the vehicle gets revealed. We are committed to bringing our customers along on the journey and showing them what we're doing to build trust.

DELOITTE: Is the journey toward fully autonomous technology a stair-step approach where people are slowly adapting to individual safety features like automatic braking or adaptive cruise control, or do you see a more immediate, revolutionary shift at some point?

MD: We see two different, coexisting paths. On one hand is the revolutionary shift we're working on to develop the technology, software, and business model required for a fully autonomous rideshare service. On the other is more of an evolutionary change built on increasingly capable driver-assist technologies.

> **"This is something that we're doing to move humanity forward, and on the Autonomous Vehicles Program team, we have a huge role in doing just that."**

DELOITTE: How do you collaborate with other development teams within General Motors that are working on advanced technologies such as vehicle electrification, light-weighting, and connectivity?

MD: Having everything under one big roof is what has enabled us to be successful. We brought our cross-functional team together at GM to work more closely in a shared space, so we actually have the autonomous team sitting near the electric vehicle team. We then pull in whomever we need to

MD: At our current rate of development, we're focused on launching in a dense, urban environment in 2019 once we are satisfied that it is safe to do so. We're committed to that and we're working hard to achieve it.

DELOITTE: Other than the technology built into the car, what are some of the other elements required to make fully autonomous vehicles a reality?

MD: Ensuring that we have adequate fleet management—including frequent safety checks—and data infrastructure in place will be essential. From there, it's on us to have the back-office connections to make sure the computing, perception, and overall vehicle technology is working as intended.

DELOITTE: As a woman leading one of the most exciting fields in the automotive industry right now, and as someone who is very passionate about STEM initiatives, what do you think is the best way to celebrate the contributions of women in automotive, and to inspire young women to consider the industry for a career?

MD: Having role models and finding a mentor is so important. I'm the first engineer in my family, which made choosing where I was going to go to school, what engineering degree I was going to pursue in undergrad, and ultimately where I was going to work quite challenging. I didn't have very many role models in STEM, and I quickly realized there weren't many engineers who looked like me. When I started as a co-op student, it was also hard to find a mentor, so I love getting out there in the community and talking to young girls, and mentoring colleagues at GM who are early in their careers.

DELOITTE: Are there examples of where mentorship or sponsorship really made a difference in your career?

MD: When I was first starting off as a co-op student, my neighbor knew a woman who worked at GM and happened to be a chief engineer. She was

sit with us at each stage of the program, including members of the design studio, purchasing, engineering, and finance. This approach enables us to move fast by increasing communication and making it easier to find the experts we need to quickly tackle complex issues. We've used the model of co-locating and working together as one team to get us where we are today.

DELOITTE: When do you think we'll get to an inflection point where fleets of autonomous vehicles are able to establish a foothold and start scaling?

"Having everything under one big roof is what has enabled us to be successful."

well-established in her career, but every time that I came back to work as a co-op student, we would meet, she'd buy me lunch, and we'd talk about how my current assignment was going and next steps. It was an informal mentoring relationship, but I continued to meet with her until she retired. She was a great advocate for me, and it taught me a lot about networking, mentorship, and building those critical relationships. GM is a big company and having somebody like that to help me navigate it and be an advocate for me was huge.

DELOITTE: One last question. If you had the chance to address a graduating class or group of young people, what would you tell them you enjoy the most about your job?

MD: One of the things I've realized recently is that I love how fearless young people are. I try to remind them never to lose that. I could have said "no" to a lot of challenging positions that frankly I thought I had no business being in along the way. But thankfully I took those opportunities to do something new and learn a new area of the business.

The coolest part of my job is the problems we get to solve. There is no recipe for what we do. There's no vehicle development timeline that matches what we're executing, but that is what makes it super fun and exciting. And if you stay fearless, you will be in a great position to solve future problems and build the foundation for an exciting career.
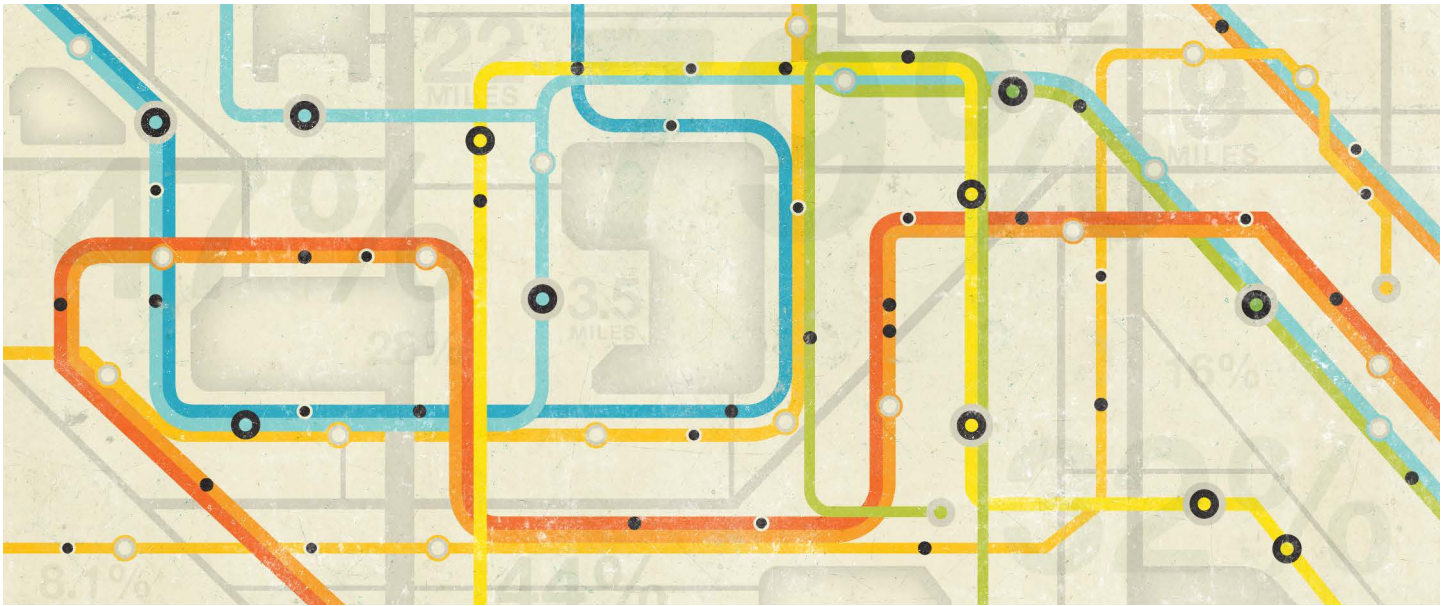
Monetizing data in the age of connected vehicles

Connected services and data monetization have long been seen as a big opportunity for automotive companies facing an uncertain future. However, the path to success may require new thinking in terms of where to play and how to win.

By Jeff Hood, Omar Hoda, and Ryan Robinson

For decades, automotive original equipment manufacturers (OEMs) have been able to find success in the relative comfort of building assets for personal consumption. But outside the industry, companies in areas such as financial services, biotechnology, and social media were hard at work finding new ways to generate revenue and grow shareholder value. Many biotechnology companies, for instance, found their niche as "technology creators," while social media players and other "network orchestrators" created asset-free revenue models based solely on bringing supply and demand together in a market exchange environment.

The differences among these business models and their implications for corporate value and investor interest can be defined by the "revenue multiplier effect," which describes how each of four core business models has twice the value of the preceding model (figure 1).[1] One of the key drivers of this phenomenon is that marginal costs are significantly lower for technology and information-based companies, making it easier for such companies to scale.[2]

Although OEMs have introduced countless innovations over the years, they have never really been credited as "technology builders" by the investment community. In fact, their valuations still hover around those of the lowest "asset builder" quadrant. So how can traditional automotive companies start moving up the revenue multiplier ladder?

The answer may be found in new business models that promise to leverage the increasing amount of data being generated, captured, and shared by the vehicle itself.

The amount of data a vehicle generates is set to explode

One major trend emerging in the global automotive sector is vehicle connectivity. Vehicles are now able to capture and share many types of data, including geolocation, vehicle performance, driver behavior, and biometrics data. Though GPS functionality has supported navigation systems for years, smarter applications of the data are adding significant value in the form of real-time traffic updates and road safety alerts. Uses for vehicle health and operational functionality data are also spreading as vehicle manufacturers continue to develop app-based tools to monitor key maintenance statistics. And while the use of advanced biometric data is still in its infancy, new sensors in the cockpit can allow vehicles to monitor key attributes of their occupants,

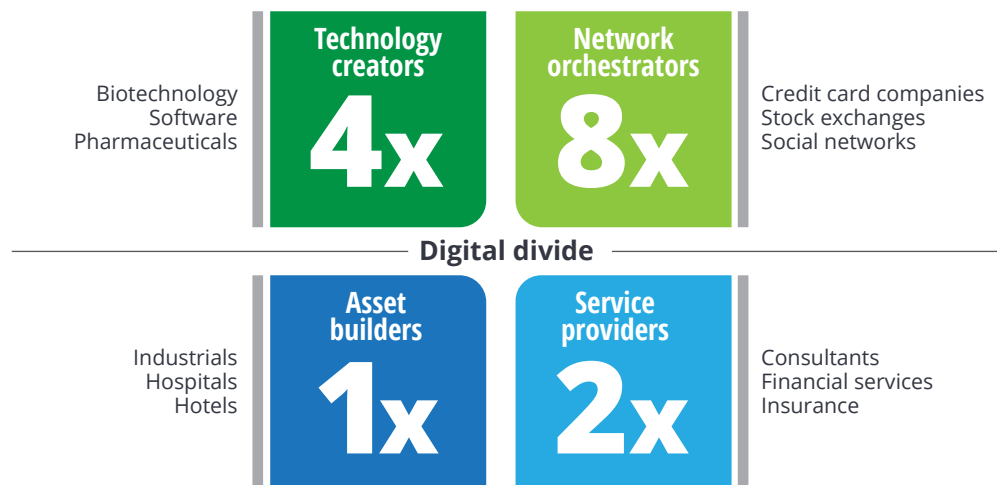including stress levels, heart rhythms, alcohol consumption, and fatigue.

However, monetizing this tremendous increase in operational and behavioral data is easier said than done—and OEMs have largely been lagging behind market disruptors entering this space. There is also good reason to wonder whether a critical mass of consumers see the increase in vehicle connectivity as a good thing. Recent study results suggest that while 79 percent of consumers in China believe increased connectivity will be beneficial, only 35 percent of German consumers feel the same.[3]

One of the first decisions for companies aiming to monetize vehicle data is where to play in the connected vehicle value chain. Potential roles exist for companies to act as:

- **Generators**, making end products capable of capturing data
- **Transmitters**, safely delivering the data to a central repository
- **Manipulators**, aggregating data from different sources into a usable format
- **Developers**, designing end-user offerings that leverage the data
- **Providers**, marketing the service offerings to both B2C and B2B audiences

FIGURE 1

The revenue multiplier effect

	Technology creators	Network orchestrators	
Biotechnology Software Pharmaceuticals	4x	8x	Credit card companies Stock exchanges Social networks

Digital divide

	Asset builders	Service providers	
Industrials Hospitals Hotels	1x	2x	Consultants Financial services Insurance

Source: Deloitte analysis.

Not every company is well-placed to succeed in each part of this value chain. For new entrants in particular, it can be difficult to create value further down the chain without access to the data being generated further upstream. Here lies one of the central issues that is currently preventing the vehicle data monetization ecosystem from developing to its full potential. Many OEMs have the data, but because they want to control every point in the value chain—even though they are not generally well positioned to do so—they are reluctant to make the data available to anyone else.

OEMs can find opportunities in data, but challenges exist

OEMs can potentially realize enormous benefits from knowing which parts of a vehicle are likely to fail and when. Real-time data sent from vehicle sensors can identify problems early, and predictive analytics can allow companies to get out in front of potential warranty and recall issues. This kind of data can also help OEMs and dealers optimize their parts inventory and technician resourcing strategies. Further, a deeper understanding of how customers use their vehicles can help OEMs design better, more customized customer experiences to improve brand affinity and loyalty.

In terms of external revenue opportunities, OEMs and other industry players are exploring a wide variety of data-based products and service offerings, including user-based insurance, mobile commerce, mobility-as-a-service (MaaS), behavioral and geo-based advertising, infotainment, and personal health monitoring. However, many OEMs are already showing their collective vulnerability to new and existing entrants looking for ways to go around them. In the case of user-based insurance, for instance, the addition of a simple plug-in allows insurance companies to gain access to vehicle usage data, thus circumventing the need to interface with OEMs. Vehicle manufacturers may also face an uphill struggle with significant consumer concern over the collection of biometric data. For example, recent survey data suggests that 63 percent of US consumers are at least somewhat concerned about biometric data being captured and shared with external parties.[4]

Fundamental questions are keeping automotive companies up at night

The complexity and dynamism that characterize the emerging connected vehicle industry has made it difficult to make decisions regarding where to play and how to win. Complications to consider include:

- **Who owns the data and who gets to use it?** The most interesting data sets are often the ones that are shared across connected ecosystems that include consumers, OEMs, and service providers. However, recent study data suggests that consumers are not fully comfortable with any one type of company managing their connected data.

- **Are consumers willing to pay for connected data services?** Consumers have come to expect basic services and free apps, so how can they be motivated to pay? Our belief is that the full spectrum of services will include both free and paid services.

- **How and with whom should we work?** For years, many OEMs have attempted to build the entire mobility data ecosystem within their four walls. However, many are now looking to adopt open platform strategies developed in conjunction with partners outside their organization.

- **How can data be protected?** Consumers may be more willing to share data for services and features that have a perceived benefit. Tech companies have been taking advantage of this for some time, so OEMs may have much to learn from them. However, any company will likely quickly lose customers' trust if the data they share is compromised.

Knowing where to focus is half the battle

The journey to creating new value from the growing amount of vehicle data starts by setting an ambition and charting a path to success. Most companies are performing "random acts of science" rather than focusing the organization on an aligned ambition. Leaders should understand both consumer trends and potential disruptors in order to uncover winning ideas. With that foundation in place, they can then set new aspirations and establish a portfolio of concepts to guide value creation. These concepts can be organized into three segments with a well-established framework called the Innovation Ambition Matrix,[5] which can enable an organization to think through monetization concepts across varying levels of abstraction from the current business model.

As companies move from concepts to tactical plans, they should ask several key questions for each opportunity they identify, including:

- What data collection, standardization, curation, privacy and analytical capabilities are required?

- Where is the value in these activities (i.e., data standardization, consent management, anonymization)?

- What critical technologies are in place, and which would have to be built?

- What should be done in-house versus outsourced to an ecosystem partner?

- How could a concept be prototyped for validation?

- What level of investment would be required to scale the concept?

Getting started isn't as easy as simply picking a team and starting a conversation. The best innovation can come from a cross-functional team that is highly skilled in today's business environment, enlightened by external research, and willing to challenge their own thinking.

The importance of driver consent

otonomo

By Lisa Joy Rosner, CMO, Otonomo

As original equipment manufacturers (OEMs), other data generators, and companies in the connected data ecosystem explore the possibilities for monetizing data by offering new apps and services, managing driver consent has emerged as a critical issue. Drivers own not only their connected car, but also their connected car data, and they expect that their personal data will stay private unless they give explicit consent for its use.

Research shows that many drivers are, in fact, amenable to sharing their data if they see enough benefit in it. In 2018, a joint Otonomo-Edison Research survey of 514 current American connected car drivers[6] found that approximately 80 percent of the drivers who expressed interest in a number of services based on connected car data—including real-time alerts of dangerous driving conditions, early detection of maintenance and repair needs, and faster response times for emergency responders in the event of an accident—were willing to share anonymous or personal connected car data in order to gain access to these capabilities.

But despite this, the drivers in the study still had general concerns about sharing data with apps and services. About two-thirds of respondents had chosen not to use an app or service because of concerns about how their personal information would be handled. Given that Deloitte's latest Global Automotive Consumer Study found that 31 percent of US consumers trust "no one" to secure the data being generated and shared by a connected car, these findings suggest that automotive manufacturers and other data generators have a clear need to protect drivers' privacy and proactively manage consent.

When deciding whether to allow an app to collect data, the Otonomo-Edison Research study found that the most important factors that drivers consider are:

- How trustworthy they perceive the company to be (66 percent indicated this was "very important"). It's encouraging that the Deloitte study found that 31 percent of consumers trust their OEMs most—but just as many trust no one.

- Whether they are told exactly what the data is being used for and who has access to it (62 percent indicated this was "very important"). In light of this finding, OEMs should consider developing consumer-facing transparency apps that are easy for drivers to understand and use.

On the anonymization front, connected car data presents numerous new complexities. Considerations include:

- Removing traditional personally identifiable information (PII) is not enough to preserve anonymity. Trip data—such as the route one takes from home to the office—and location data also can be used to identify a driver.

- More than one person may drive the same vehicle—yet hold different views about what data they are willing to share.

When communicating with drivers and asking for consent, data generators need to be sure that they are addressing these and other considerations in their data anonymization strategies as well as with consent management technology.

Sourcing innovation

New collaboration models are shaping the future of the automotive industry

Automakers are navigating new ecosystems and testing new collaboration models. They can succeed by preparing the organization for change before it occurs.

By Marc Holzer, Omar Hoda, Jeff Glueck, and Jason Karew

Today's automotive original equipment manufacturers (OEMs) and suppliers face a complex environment unlike anything the industry has experienced before. Electrification, the sharing economy, autonomous vehicles, nontraditional entrants to the industry, the growth of new products and services enabled by digital business models—these factors combined are driving uncertainty about the future and significantly influencing strategy decisions around the globe.

In response to these challenges, M&A and strategy executives should reexamine their approach and strategy around dealmaking. The traditional playbook for "where to play and how to win" has fundamentally changed. It's no longer a question of simply finding, acquiring, and integrating competitors to realize cost savings. Rather, M&A executives often now need to better equip an organization to adapt, change, and grow in a world where the value system is changing, new ecosystems are emerging, cooperation among competitors is accelerating, and new business models are disrupting established industry players (figure 1). And it's not just traditional M&A that can have this focus. A variety of collaborative efforts, from joint ventures to investments to partnerships, can be used to gain access to potentially transformative innovations and capabilities. This article explores a framework that M&A executives can use which goes beyond the traditional playbook to find and exploit

opportunities for growth and innovation, focused around two key activities: engaging with ecosystems, and successfully integrating innovation and capabilities developed outside the organization.

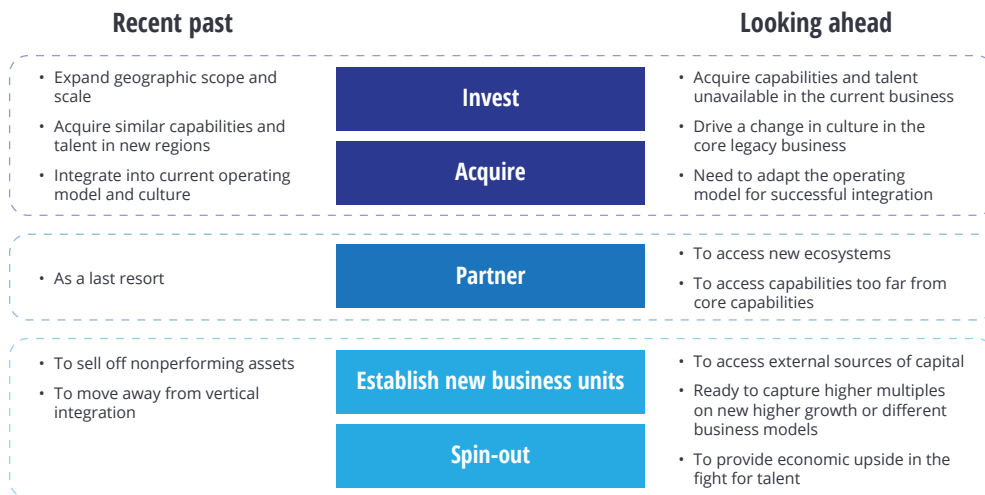## Engaging the ecosystem: Meet me in ... Tel Aviv?

Detroit, Stuttgart, Tokyo: These are the traditional hubs for the automotive industry's ecosystems, where OEMs and suppliers headquarter, operate, and collaborate. But those aren't the only places where the future is being built. Increasingly, innovative new technologies and business models are being developed and incubated in places that weren't even on the automotive map five years ago—places like Tel Aviv, Silicon Valley, and Boston, among others. To gain access to innovations, a physical presence and substantive operations in these locations can be vital to an automaker's strategy. This presence can take many forms, including office spaces to attract and retain talent in areas such as robotics, software

development, and cybersecurity, or "working labs" that give automakers the opportunity to physically engage with startups to support product development and innovation.

To compete effectively, automakers should consider new models of collaboration and sharing that are both farther-reaching and more nuanced than traditional OEM-supplier agreements. This might mean investing in startups, either financially or through co-development arrangements, or becoming a limited partner in a venture capital fund to gain exposure to new ideas and business models. It also means that automakers may need to reach outside the industry for expertise—most likely to the technology industry to gain access to capabilities in areas such as cloud, connectivity, cybersecurity, and data management. An acquisition of, or investment in, a startup might be a strategic option—but more likely, a physical presence that drives collaboration and shared learnings within the ecosystem will be a smart first step and may, on its own, give the automaker the access to the talent and innovation it seeks.

FIGURE 1

The traditional M&A transaction model differs from the model likely needed to succeed in today's dynamically changing environment

Recent past		Looking ahead
• Expand geographic scope and scale	**Invest**	• Acquire capabilities and talent unavailable in the current business
• Acquire similar capabilities and talent in new regions		• Drive a change in culture in the core legacy business
• Integrate into current operating model and culture	**Acquire**	• Need to adapt the operating model for successful integration
• As a last resort	**Partner**	• To access new ecosystems
		• To access capabilities too far from core capabilities
• To sell off nonperforming assets	**Establish new business units**	• To access external sources of capital
• To move away from vertical integration		• Ready to capture higher multiples on new higher growth or different business models
	Spin-out	• To provide economic upside in the fight for talent

Source: Deloitte analysis.

FIGURE 2

The Doblin Innovation Matrix can help guide decisions around acquired capabilities and innovations

TRANSFORMATIONAL
Developing breakthroughs and inventing things for markets that don't yet exist

ADJACENT
Expanding from existing business into "new to the company" business

CORE
Optimizing existing products for existing customers

Where to play (Markets and customers) — New / Adjacent / Existing

How to win (Products and assets) — Existing / Incremental / New
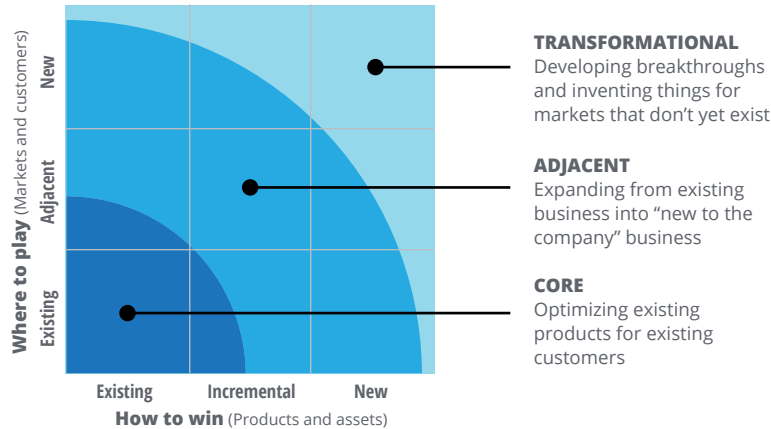
Source: Steve Goldbach and Geoff Tuff, *Detonate: Why and How Corporations Must Blow Up Best Practices (and Bring a Beginner's Mind) to Survive* (Wiley, 2018).

Integrating acquired innovations and capabilities: "Landing pad" or "Launch pad"?

When considering how to integrate an externally sourced innovation or capability, the Doblin Innovation Matrix® (figure 2) can serve as the starting point of a road map to help companies determine "where to play" and "how to win"—that is, to figure out what to do with the innovation or capability being integrated. This calculus applies most obviously to assets acquired outright through M&A, but it also can be useful when deciding how to operate "assets" acquired through other means.

A simple perspective is that a core or adjacent innovation may help reinvigorate the core business by using it as a "landing pad" (to house, integrate, and operate the new business). However, to meaningfully unlock value, a transformational innovation may require the creation of a new business—a "launch pad" with a clear financial perimeter—that, though loosely linked to the core, may be housed

in a separate entity that can be valued by markets independently of the legacy core.
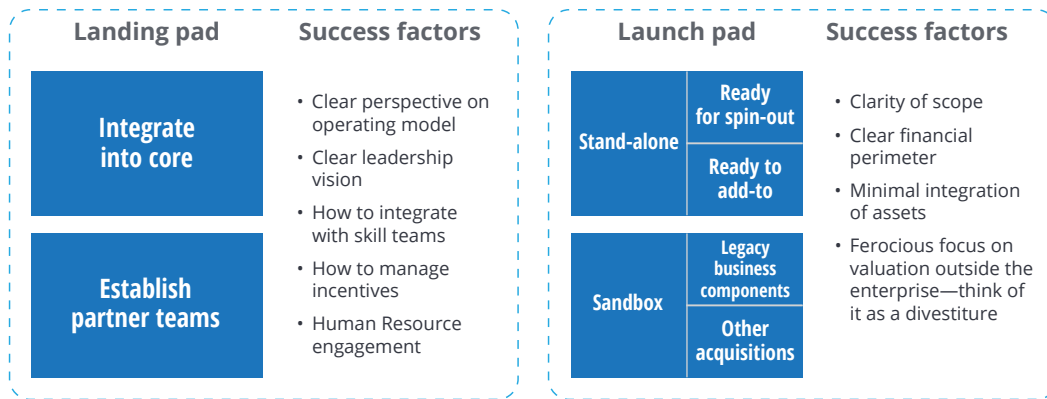
We suggest that automotive companies look at externally sourced assets through a "landing pad"/ "launch pad" lens to determine how to approach the integration process. Companies should consider the trade-offs involved in either integrating the target into the core business—thereby determining how the acquired capabilities will operate after they become part of their core business—versus setting up the target as a separate business entity with its own distinct culture—thereby making it easier to strategically adopt the target's capabilities without disrupting the legacy business. Each type of integration has its own well-defined success factors (figure 3).

Examples of recent actions by automakers include:

- **Investment ("launch pad")**: In June 2018, Toyota Motor Corporation announced a US$1 billion investment in Singapore-based ride-hailing service Grab. The investment provides

FIGURE 3

Each approach to integration has its own well-defined success factors

Landing pad	Success factors
Integrate into core	• Clear perspective on operating model • Clear leadership vision • How to integrate with skill teams • How to manage incentives • Human Resource engagement
Establish partner teams	

Launch pad		Success factors
Stand-alone	**Ready for spin-out**	• Clarity of scope • Clear financial perimeter • Minimal integration of assets • Ferocious focus on valuation outside the enterprise—think of it as a divestiture
	Ready to add-to	
Sandbox	**Legacy business components**	
	Other acquisitions	

Source: Deloitte analysis.

access to Grab's mobility data, which will benefit Toyota as the company continues its transformation from an asset producer into a mobility provider.[1]

- **Partnership ("landing pad")**: In October 2018, Honda and General Motors announced a partnership in which Honda will invest US$2.75 billion in General Motors' efforts to develop autonomous vehicles. The investment will take place over 12 years, with a global deployment of autonomous fleets as the end goal.[2]
- **Acquisition ("launch pad")**: In 2017, Ford Motor Company acquired Argo AI to bolster its artificial intelligence capabilities. The acquisition gave Ford access to Argo's robotics capabilities and startup ethos to bolster Ford's autonomous vehicle development.[3]

Creating value

Successful enterprisewide change requires agility, something that many established companies—with their deep-rooted business models, hundreds of thousands of employees, and global operations—find hard to achieve. But to master change and successfully operate in new places with new partners, automakers should rapidly adjust their core to be able to work with new ecosystems. They also should remain open to changes created by the future of work, and they should get comfortable with the idea that the core may—almost inevitably—need to absorb new capabilities.

If managed correctly, acquiring (or collaborating with) the right talent, culture, and technology can jump-start a company's innovation mindset. However, the reverse can also happen if the integration is forced and not effectively managed. To be successful, it can be critical to break down hardened silos so that the M&A, strategy, business development, and human resources teams can collaborate to execute the business case that prompted the collaboration in the first place.

Most importantly, to gain value from transformative talent and technology, automakers likely need a coherent model for how the acquired capabilities will operate after they become part of their core business. Typically, how to operate a new asset is rarely given as much thought as how to value and extract cost synergies, which we view as a mistake. Companies should solidify the new operating model before engaging in partnerships, acquisitions, and alliances, because given the significant capital requirements of being a leader in the new ecosystem, waiting until after the deal is announced or concluded could be risky. This approach is

radically different than the typical merger integration approach of cutting costs, closing plants, and rationalizing operations. It can require a keen focus on growth, employee retention, and maintaining progress in developing (relatively) unknown technologies and business models.

Another critical success factor can be the courage to admit failure, cut losses, and move on when necessary. After all, the vast majority of startups fail, and the vast majority of new business models never take off.[4] Automakers investing in the new mobility ecosystem should realize that a significant number of their bets will likely fail—but they should focus on learning as much as they can from the failures and adjust their organization's capabilities and culture going forward.

It's a complicated new world for automakers, their boards, and their executives. Strategy, M&A, and HR leaders are typically more important to success than at any time in recent memory. To remain competitive, automakers should engage with, and take advantage of, the new ecosystem of both old and new industry players. Some key considerations include:

- Make sure that the company participates, which includes having a presence or strategy, in the industry's emerging ecosystems. The board and executives should decide what they want the company to be in the future, measure progress toward that vision, and revisit their goals regularly.
- Take stock of the ecosystem to determine which key players should be collaborated with, partnered with, or acquired outright to accelerate the path to the future. Companies should pursue new alliances and be prepared to both succeed slowly and fail fast.
- Get the organization ready for change before it happens. Don't wait until the capital is deployed and the deal is made. Be ready to embrace new collaborators, skills, digital DNA, and alliances by determining the desired operating model in advance.

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