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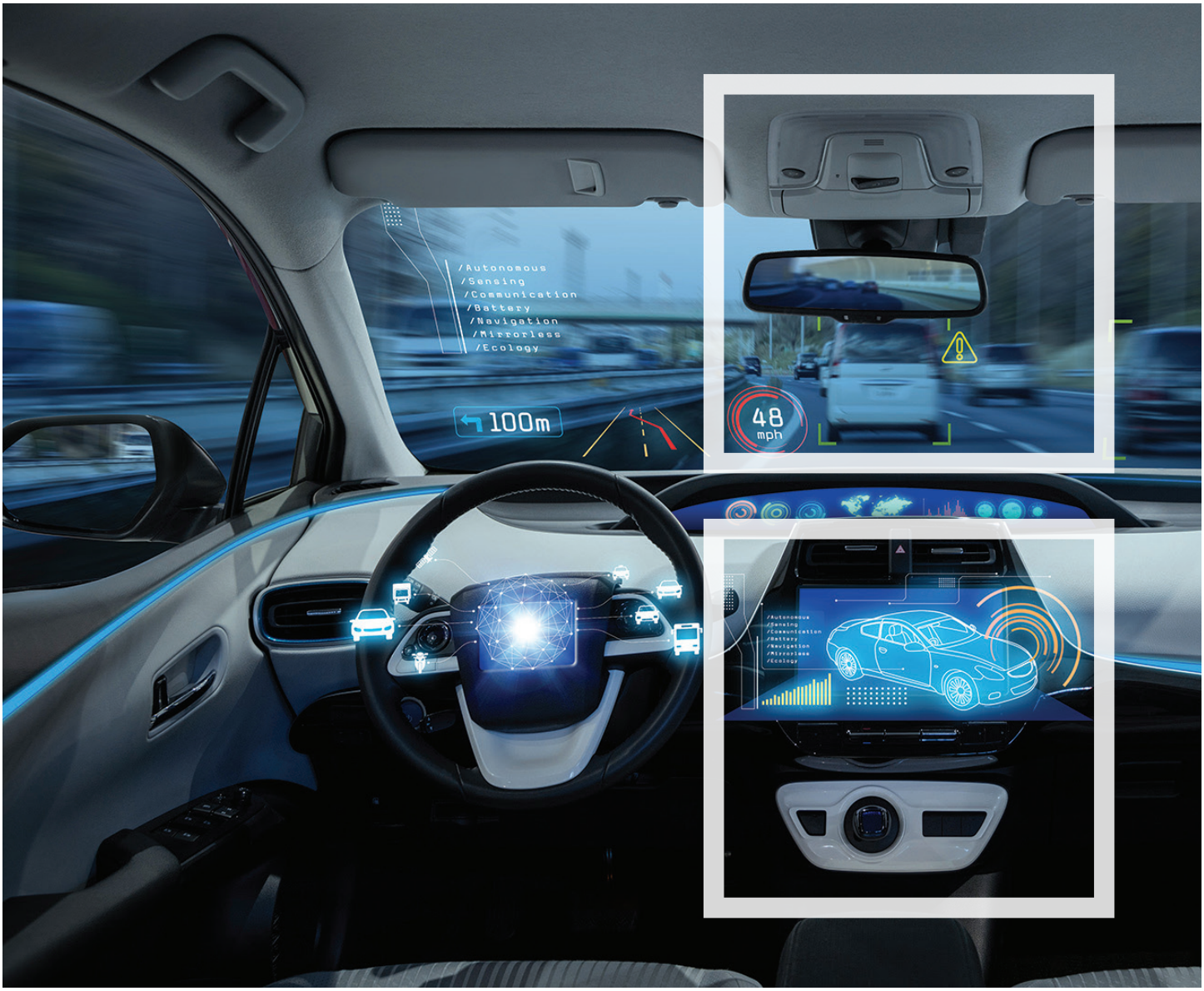
FOLEY & LARDNER LLP

2017 Connected Cars & Autonomous Vehicles Survey



Executive Summary

We're in the midst of a rapid evolution not only in the way drivers operate their vehicles, but also in the operations, compliance, go-to-market strategy and cyber preparedness of the entire automotive industry. **IHS Markit** predicts that more than 70 million connected cars will be on the road by 2023. Following closely are autonomous vehicles, as we've already seen models deployed with semi-autonomous functionality, including auto-steering, self-parking, autonomous lane changing and collision-avoidance features.

Due in large part to innovations spurred by catalysts like the Internet of Things, sensor technologies and computational data analysis, automakers have been joined by a growing list of companies from outside the traditional automotive supply base in the race to build a truly connected car, and ultimately the first completely autonomous vehicle. As these smarter, interactive and self-sufficient machines change our entire view of transportation and mobility, industry players must weigh their competitive pursuits and market moves against the new regulations and industry standards coming down the pike.

Against this backdrop, law firm **Foley & Lardner LLP** surveyed leading automakers, suppliers, startups, investors and technology companies on the business and legal issues impacting the development of connected cars and autonomous vehicles. The perspectives and attitudes of respondents suggest that the most successful industry players will be those that innovate and build technological capabilities toward full connectivity and autonomy.

In the interest of using a common lexicon, given that the terms "connected cars" and "autonomous vehicles" are used fairly broadly, we've defined these two categories distinctly as:

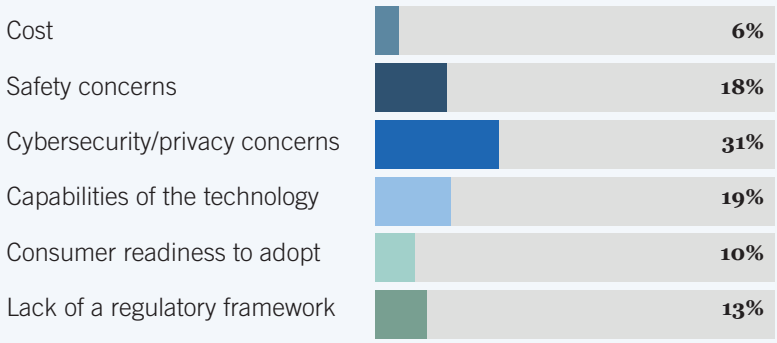
- **Connected Cars:** Vehicles equipped with any variety of sensors that enable communication with the driver, other vehicles, roadside infrastructure and the cloud in order to improve vehicle safety, efficiency and rider experience.
- **Autonomous Vehicles:** Fully automated or self-driving vehicles that are capable of operating without direct driver action to control steering, acceleration and braking. Currently, vehicles may be computer-driven or computer-assisted driven, with various levels of autonomy, as well as connected features that allow exchanges of data.

Highlights of Foley's 2017 Connected Cars & Autonomous Vehicles Survey include:

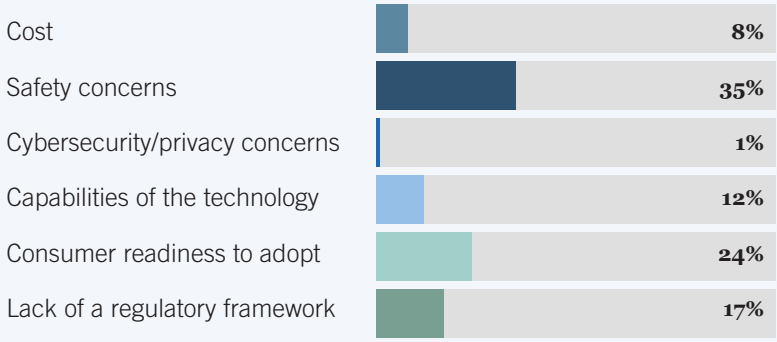
- Connected cars and autonomous vehicles face different obstacles to growth, partly because the respective technologies are at different stages of development and implementation. Respondents expressed the greatest level of concern with cybersecurity and privacy issues associated with the more mature connected car technologies, whereas safety and consumer readiness to adopt topped the list of perceived barriers for autonomous vehicles.
- Only 15 percent of respondents believe startups and the technology they're developing are *not* disrupting traditional automotive supply chains. These emerging players are also increasingly understood and viewed by traditional automakers and suppliers as direct competitors, but also as potential collaborators, signaling a growing acceptance of these new entrants in the automotive space.
- Respondents anticipate substantial changes to the automotive sales process over the next five years. The majority (77 percent) expect automakers to increasingly bundle connected services and/or autonomous features at the point of sale. Furthermore, nearly one-quarter of automakers and suppliers (23 percent) expect these technologies to account for at least 20 percent of their sales by 2025.
- Reflecting the broadened nature of the industry, the high concentration of capital and innovative technology companies in Northern California led 70 percent of respondents to identify this region as a leader in the development of connected cars and autonomous vehicles. That said, nearly half of respondents (46 percent) expect Detroit to remain a leader, reinforcing the notion that automotive companies and suppliers in the Motor City will continue to play a critical role, albeit one they will increasingly share with other innovation centers around the world.
- As with any new technology, connected cars and autonomous vehicles are the target of new regulations and industry standards. While this area has been lacking comprehensive oversight to this point, most respondents (62 percent) prefer that the federal government (e.g., Congress or the U.S. Department of Transportation) eventually create nationally consistent rules.
- The development and implementation of technologies for connected cars and autonomous vehicles creates a variety of challenges. More than half of respondents (54 percent) identified cost and time commitment as a top concern, followed by shortcomings of roads and public infrastructure (39 percent), regulation and legal risks (37 percent), and standardization of vehicle-to-vehicle communication technologies (37 percent).
- In developing these technologies, the most pressing legal issues for respondents were identified as cybersecurity attacks (63 percent), intellectual property protection (58 percent) and personal injury and property liability (55 percent).
- Despite the fact that connected cars and autonomous vehicles are on different timelines and paths toward widespread acceptance and adoption, the majority of respondents' companies are simultaneously developing technology for both. Fifty-six percent said connected services are a current focus, and 52 percent said the same of autonomous features.

In the charts that follow, some aggregate percentages do not equal 100 percent due to rounding or because respondents were invited to select more than one answer. Refer to page 14 for more detail on the survey methodology and a breakdown of respondent demographics.

1 WHAT DO YOU SEE AS THE BIGGEST OBSTACLE TO THE GROWTH OF CONNECTED CARS?



2 WHAT DO YOU SEE AS THE BIGGEST OBSTACLE TO THE GROWTH OF AUTONOMOUS VEHICLES?



While they are often discussed interchangeably, there are clear distinctions between connected cars and autonomous vehicles with regard to what could prevent them from reaching their growth potential. Connected car technologies are already prevalent today with increasing ease of access, convenience and affordability. Not unlike smartphones and other connected devices, cybersecurity and privacy are a significant concern for connected cars, with the largest percentage of respondents (31 percent) selecting this as the biggest obstacle to adoption.

As for autonomous vehicles, the biggest perceived barrier among our respondents is reluctant consumers who may be concerned about the safety and viability of riding in self-driving cars and sharing the road with others. Thirty-five percent of respondents selected safety as the biggest obstacle to growth for autonomous vehicles, followed closely by consumer readiness to adopt (24 percent). A stronger regulatory framework – a concern on the minds of respondents for both connected cars (13 percent) and autonomous vehicles (17 percent) – could help alleviate that doubt and deliver self-driving cars that are tested and accepted by the general public. While cybersecurity and privacy were not identified as primary obstacles at this stage of the autonomous vehicle's development, that very well could change in the coming years as adoption increases, just as we're seeing now with connected cars.

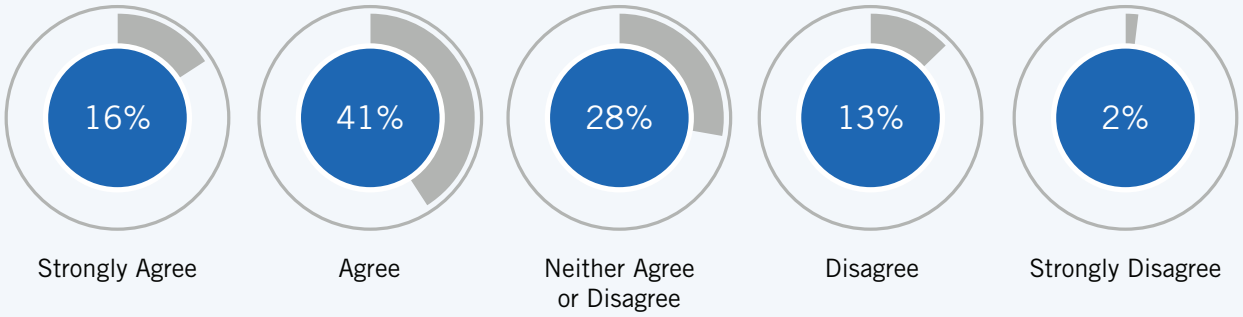
"Given the prevalence of connected car technologies, it's not surprising that cybersecurity and privacy are top of mind with industry executives. With the deployment of autonomous vehicles further on the horizon, convincing consumers of the viability of self-driving cars and the potential to reduce accidents is a more near-term focus."

Mark Aiello, co-chair of Foley's Automotive Industry Team and partner in the Detroit office

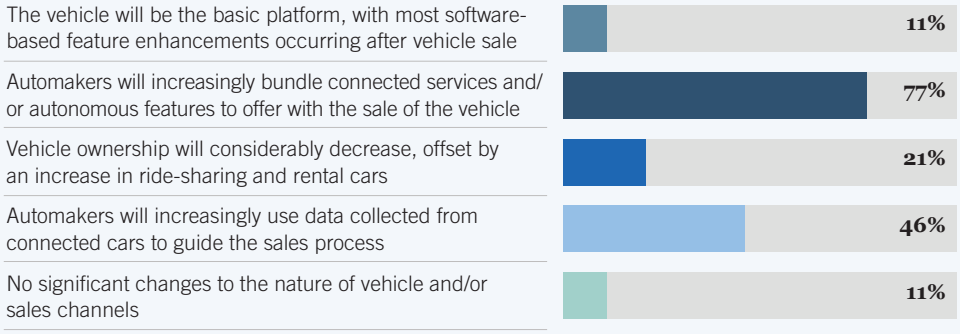
"I expect automakers will develop autonomous capabilities in ways that comply with existing laws first (e.g., adaptive cruise control, lane assist, auto-brake), so even though the cars could be fully autonomous, it will take five to 10 years of people using these autonomous-lite features before they are comfortable with the idea of full autonomy."

– Banking Industry Respondent

3 TO WHAT EXTENT DO YOU AGREE WITH THE FOLLOWING STATEMENT: STARTUP COMPANIES AND/OR THEIR TECHNOLOGIES ARE DISRUPTING TRADITIONAL AUTOMOTIVE SUPPLY CHAINS.



4 HOW DO YOU ENVISION AUTOMOTIVE SALES CHANGING OVER THE NEXT FIVE YEARS? (CHECK ALL THAT APPLY)



Only 15 percent of respondents believe that accelerated technological innovation and new entrants into the automotive space are *not* disrupting traditional automotive supply chains. Traditional original equipment manufacturers (OEMs) are being pushed – with respect to both their technology and business strategy – by their counterparts in the technology industry who see opportunity to seize market share at every point along the supply chain. In addition, startups cover all types of technologies and involve players at different levels in the vertical chain. No traditional automotive company, from automakers to first and second-tier suppliers, is immune to such competition.

Respondents also expect substantial changes to the automotive sales process in the near term. The vast majority (77 percent) anticipate that automakers will look to bundle more connected services and/or autonomous features at the point of sale. One issue will be how sellers differentiate themselves from competitors in this space. As big data continues to permeate every industry, roughly half of respondents (46 percent) believe automakers will increasingly leverage data collected by connected cars to guide the sales process.

While current trends indicate that the percentage of ride-sharing and new rental car services may increase over the next several years, respondents do not yet expect this to considerably decrease vehicle ownership. This may be because an uptick in such services will also increase the number of miles traveled by drivers, which may mean they'll need to purchase cars more frequently, translating into more sales. Car ownership could eventually change, with consumers purchasing car usage in segments (mobility as a service) rather than owning or leasing the entire vehicle.

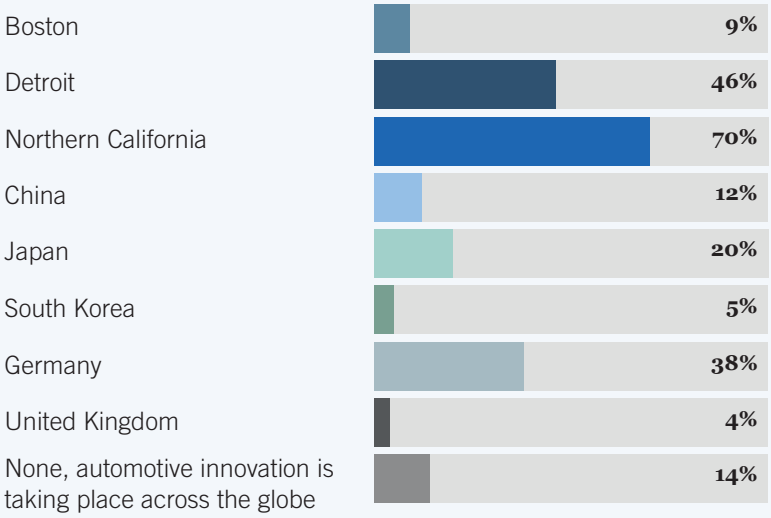
"Industry stalwarts recognize that competition is now coming from all sides and must be taken seriously. As various participants seek market share in this ripe area, we anticipate continued disruption in the automotive industry and new types of collaborations between automotive and technology companies to drive innovation."

David Kantaros, co-chair of the firm's Technology Industry Team and partner in the Boston office

"Fleets will be built and sold to ride-sharing service providers just as they now sell and lease to rental-vehicle service providers."

– Startup Company Respondent

5 WHAT REGIONS DO YOU SEE AS LEADERS IN THE CONNECTED CARS AND AUTONOMOUS VEHICLES SPACE? (SELECT AT MOST 3 OPTIONS)

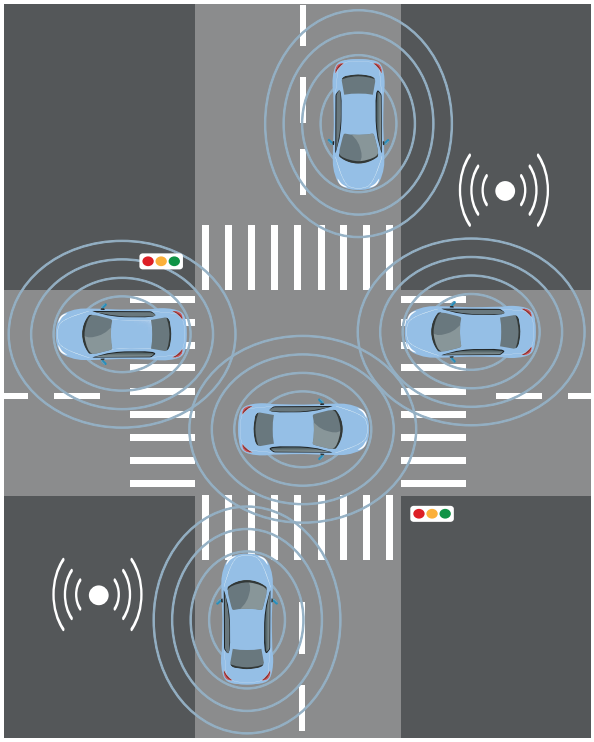


"The survey results affirm the important role of new technologies in the automotive industry. Incumbents are increasingly embracing these changes through startup investments and acquisitions, while new entrants are positioning themselves for successful integration into traditional supply chains through commercial partnerships with incumbents. Whether Silicon Valley and Detroit are on a collision course or a collaborative and integrated path forward remains to be seen, but in the near-term, we expect each will continue to do what they do best – innovate and produce."

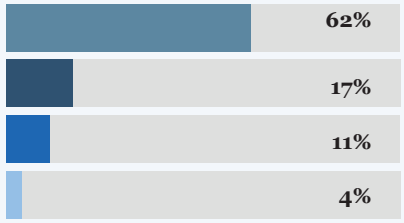
Todd Rumberger, co-chair of the firm's Technology Industry Team, vice-chair of the Private Equity & Venture Capital Practice, and partner in the Silicon Valley office

Further signaling the growing acceptance of technology startups as change agents in the automotive industry, the highest percentage of respondents (70 percent) selected Northern California as a regional leader in the development of connected cars and autonomous vehicles. However, the strength of the automotive companies and suppliers in Detroit remains a key driver of the movement according to nearly half of respondents (46 percent), especially as traditional automakers look to expand their investment and innovation activities to other regions. How traditional technology and automotive companies collaborate in the future will be highly important for both regions.

The demographics of our respondents may explain the greater emphasis placed on domestic regions, but the survey also revealed an expectation for developments in this space abroad. Respondents anticipate most innovation from Germany (38 percent), which is not surprising given its concentration of large automakers and suppliers, as well as startup companies. While respondents are starting to eye China (12 percent), this percentage will likely rise quickly, especially on the supplier side, given that nation's focus on electronics and battery technology, as well as the government's accelerating investment efforts.



6 IN YOUR OPINION, HOW SHOULD CONNECTED CARS AND AUTONOMOUS VEHICLES BE REGULATED?



The race to deploy connected cars and autonomous vehicles has continued despite uncertainty surrounding the future regulatory landscape, but Washington appears to be catching up and close to setting the course for future development. In early September, the U.S. House of Representatives took a step forward when they unanimously approved the Safely Ensuring Lives Future Deployment and Research In Vehicle Evolution Act (SELF DRIVE Act), which would be the first major federal effort to regulate autonomous vehicles beyond the previously adopted voluntary guidelines. A similar legislative package is being worked out in the Senate, and the U.S. Department of Transportation (DOT) and National Highway Traffic Safety Administration (NHTSA) released new federal guidance in mid-September.

This progress is welcomed by nearly two-thirds of respondents (62 percent) who said they believed nationally consistent rules from DOT and NHTSA would be the best approach to regulating the space. Under the proposed House legislation, states may still continue to regulate licensing, registration, liability, safety inspections and certain other aspects of vehicles and their operation, but the federal preemption language will help push toward a regulatory regime that avoids a patchwork of state requirements, which could stifle the rollout of more advanced and adequately tested vehicles.

"Given the significant financial and safety stakes, the sophisticated nature of the technology and the likely pervasive impact on society, it is not efficient for 50 different states to dictate the development of the industry. The legislation moving through Congress should serve as a springboard to further guidance and rules that will spur development and innovation, prioritize safety and emphasize education."

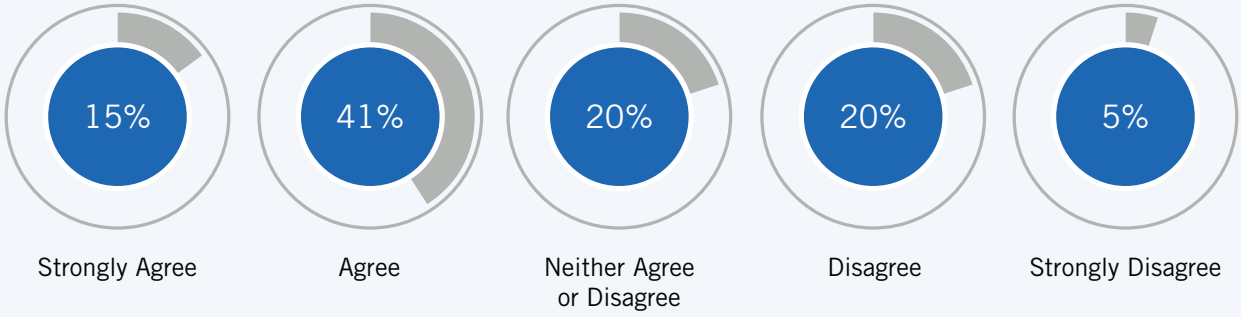
Steve Hilfinger, co-chair of Foley's Manufacturing Industry Team and partner in the Detroit office

"Developing and fielding autonomous vehicle technology is going to become increasingly dependent on support of the federal government to develop national regulations."

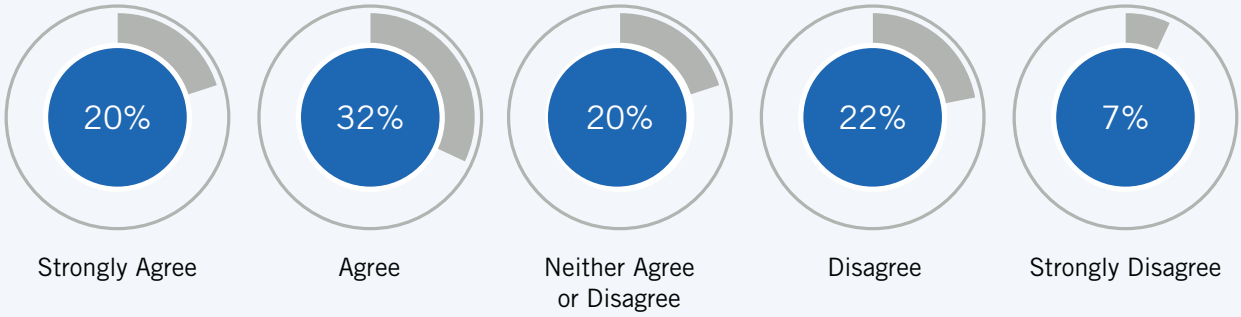
– Automotive Supplier Respondent

The following questions were only answered by traditional automakers, suppliers, startups or large tech companies.

7 **TO WHAT EXTENT DO YOU AGREE WITH THE FOLLOWING STATEMENT: DEVELOPING TECHNOLOGY FOR CONNECTED CARS IS A FOCUS OF OUR COMPANY.**



8 **TO WHAT EXTENT DO YOU AGREE WITH THE FOLLOWING STATEMENT: DEVELOPING TECHNOLOGY FOR AUTONOMOUS VEHICLES IS A FOCUS OF OUR COMPANY.**



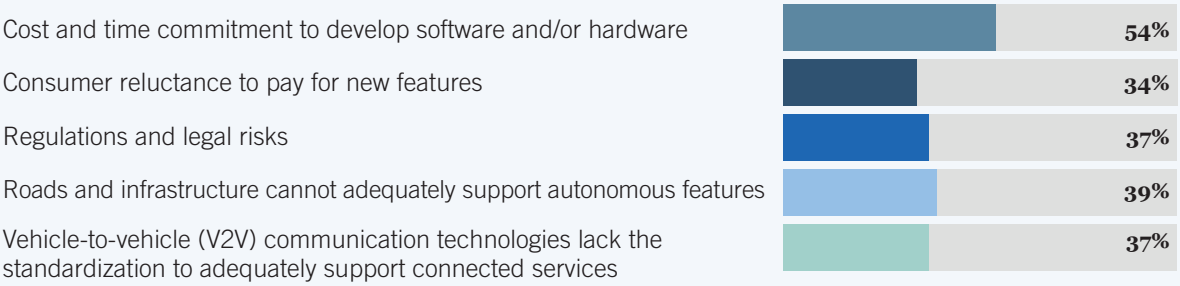
Respondents are only slightly more focused on developing technology for connected cars (56 percent) than autonomous vehicles (52 percent). While most industry experts predict that autonomous vehicles will lag well behind connected cars in the timing of adoption, the survey responses reinforce the idea that resources must be devoted concurrently to both clusters of technologies in order to keep pace with competitors and specialized companies.

Current inventories, build schedules and launches, and investments require companies to focus on autonomous vehicles now to be best situated when these technologies become more mainstream in the future. In other words, success depends on the ability to live in today's and tomorrow's worlds at the same time.

"The next 15 years will be very interesting with a mixed field of technologies and approaches offering plenty of opportunities for new players to explore disruptive approaches."

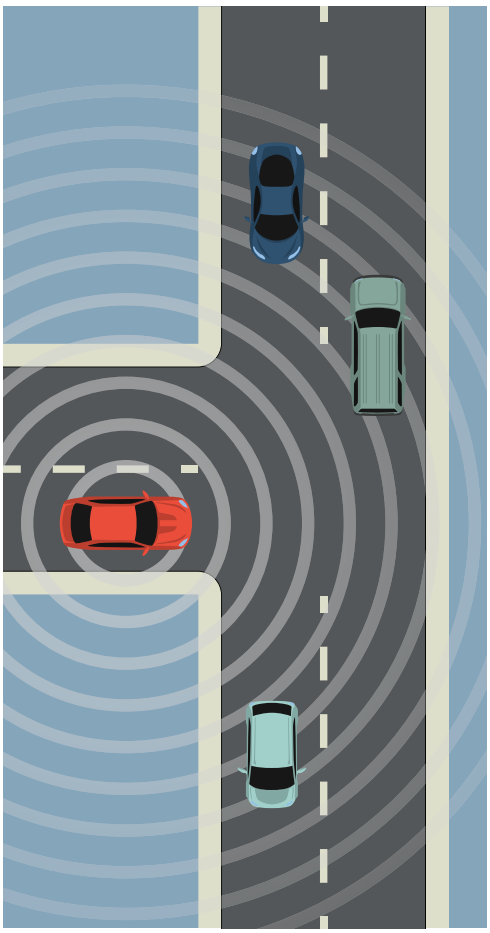
– Startup Company Respondent

9 WHICH OF THE FOLLOWING REPRESENT KEY CHALLENGES FACING YOUR COMPANY IN DEVELOPING OR IMPLEMENTING TECHNOLOGIES FOR CONNECTED CARS AND/OR AUTONOMOUS VEHICLES? (CHECK ALL THAT APPLY)



Consistent with the previous findings (i.e., balancing the present with the future), the highest percentage of respondents (54 percent) identified cost and time commitment as the biggest challenges facing the development and implementation of these technologies.

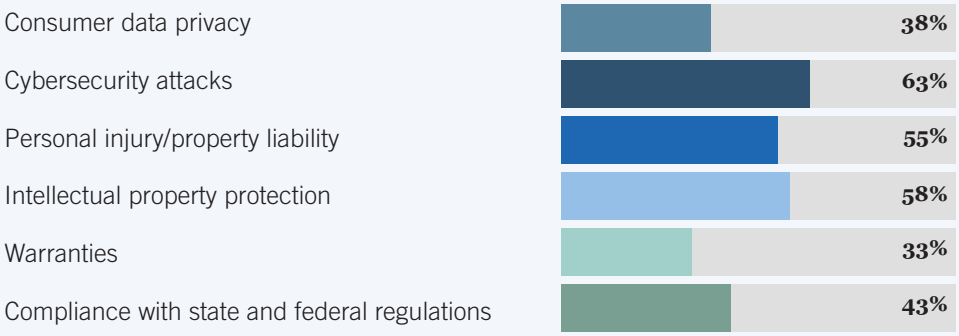
The shortcomings of roads and infrastructure – and the resulting compatibility issues with autonomous features – are also a key challenge faced by companies (39 percent). Respondents appear to feel that comprehensive infrastructure reform should be handled by the federal government – including the funding, support and delivery of projects in several sectors – otherwise this percentage may have been even higher. Other key concerns on the radar of 37 percent of those developing technologies for connected cars and/or autonomous vehicles are regulations and legal risks and V2V communication technologies, where industry standards are in development.



"Connected cars are going to impact the connectivity of our physical infrastructure, which needs to undergo a tremendous amount of digital transformation. Cities and countries would have to work on both investment and regulation to make this happen."
– Technology Company Respondent

"It will be a long time before there will be critical mass of infrastructure capabilities and percentage of capable vehicles to make this a viable solution with broad acceptance."
– Automotive Supplier Respondent

10 WHICH OF THE FOLLOWING LEGAL ISSUES ARE OF CONCERN TO YOUR COMPANY WHEN DEVELOPING TECHNOLOGY FOR CONNECTED CARS AND/OR AUTONOMOUS VEHICLES? (CHECK ALL THAT APPLY)



Cybersecurity attacks emerged as the top concern for 63 percent of respondents in developing technology for connected cars and/or autonomous vehicles. Manufacturers must consider their own enterprise systems, the vehicle's systems, the driver's connected systems in the infotainment center (and any connected devices) and the interconnectedness of all this with the immediate environment. Today's cars can have 50 or more electrical controls units – each of which is analogous to a separate computer – networked together. The volume of sensors collecting information about us, our cars and our driving habits will only increase in the future.

The second-highest percent of respondents (58 percent) selected intellectual property protection as a priority legal issue, as it provides a way for companies to differentiate and protect market share. IP protection encompasses questions around who owns the IP, keeping it safe and preventing theft. Companies can mitigate risk in this area by setting clear company guidelines for capturing IP and deciding on the form of protection, as well as having sound and consistent management of contracts and agreements when involved in joint collaborations.

Questions of liability over who is responsible for car accidents (i.e., the manufacturer or the owner) concern more than half of respondents. The steady shift from human input toward autonomous operation creates unique and complex questions for not only the consumer, but also for fellow motorists, manufacturers and their suppliers. These questions will take years to work themselves through legal, business and personal evaluations.

"Connected car and autonomous vehicle technologies raise an array of intellectual property considerations. Whether a company focuses more on developing hardware components or software solutions, they need to be hyper-attuned to leveraging their own IP to gain and protect market share, as well as to addressing risk from competitors' IP."

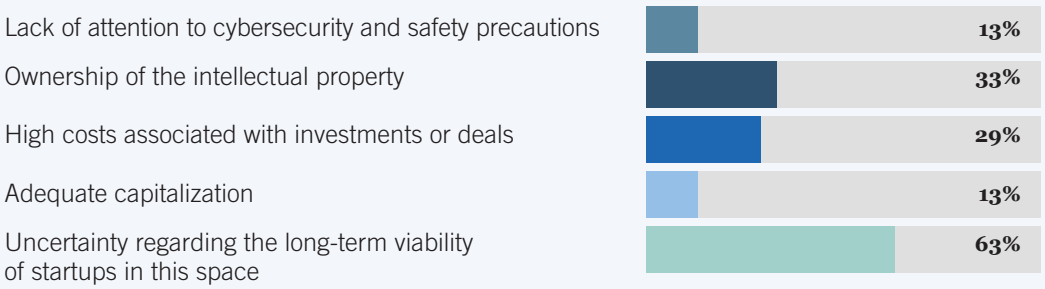
Pavan Agarwal, partner in the Washington, D.C. office and former chair of Foley's IP Department

"Regulatory issues and discussions about liabilities will make the transition to autonomous vehicles much slower than most analysts anticipate."

– Startup Company Respondent

The following questions were only answered by traditional automakers and suppliers.

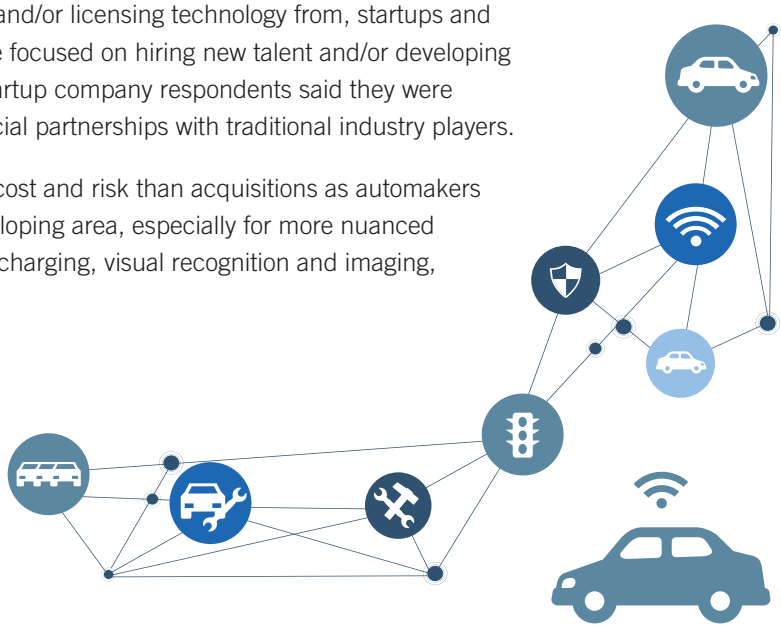
11 WHICH OF THE FOLLOWING ARE OF CONCERN TO YOUR COMPANY WHEN WORKING WITH STARTUPS IN THE CONNECTED CARS AND AUTONOMOUS VEHICLE SPACE? (CHECK ALL THAT APPLY)



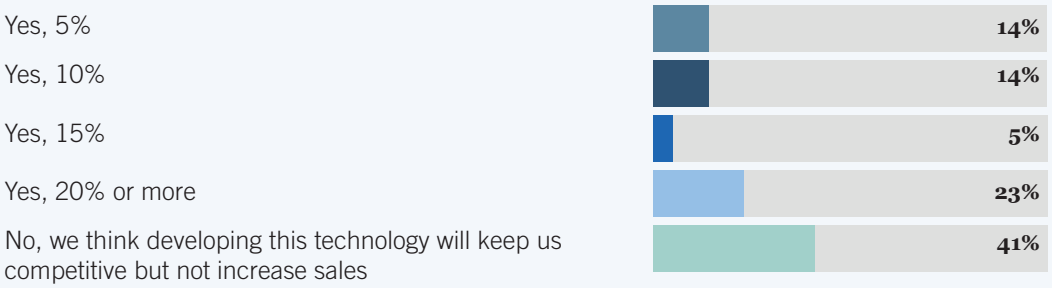
The majority of traditional automaker and supplier respondents (64 percent) identified the long-term viability of startups as a concern in working with emerging companies developing technologies and solutions for connected cars or autonomous vehicles. While there are several examples of automotive companies acquiring tech startups, this uncertainty may help explain why traditional automakers and suppliers are also pursuing partnerships with startups to develop specific technologies and capabilities.

In a follow up question asking automotive industry respondents about their primary strategy for developing technology for connected cars and/or autonomous vehicles, roughly half indicated a focus on strategic or commercial partnerships with, and/or licensing technology from, startups and technology companies. The other half said they were focused on hiring new talent and/or developing technology in-house. Similarly, roughly half of our startup company respondents said they were positioning their businesses for strategic or commercial partnerships with traditional industry players.

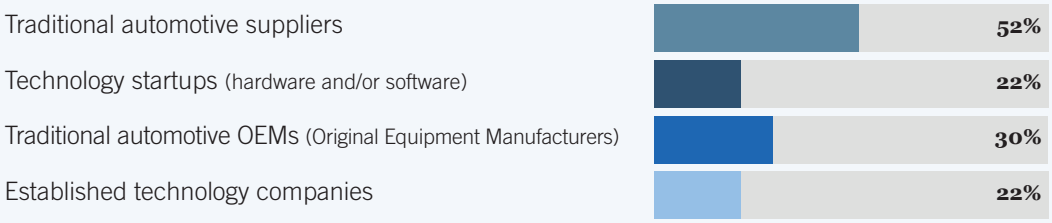
These types of arrangements or alliances carry less cost and risk than acquisitions as automakers and suppliers work to stay ahead in this rapidly developing area, especially for more nuanced technologies with specific applications (e.g., battery charging, visual recognition and imaging, exterior radar, fuel-efficient shifting, etc.).



12 BY 2025, DO YOU EXPECT CONNECTED CARS AND/OR AUTONOMOUS VEHICLE TECHNOLOGY TO GENERATE A GREATER PORTION OF YOUR COMPANY'S SALES? IF SO, APPROXIMATELY WHAT PERCENTAGE DO YOU EXPECT IT TO COMPRISE?



13 WHO CURRENTLY IS – OR WILL BE WITHIN THREE YEARS – YOUR PRIMARY COMPETITION IN THE CONNECTED CARS AND/OR AUTONOMOUS VEHICLES SPACE? (SELECT AT MOST 2 OPTIONS)

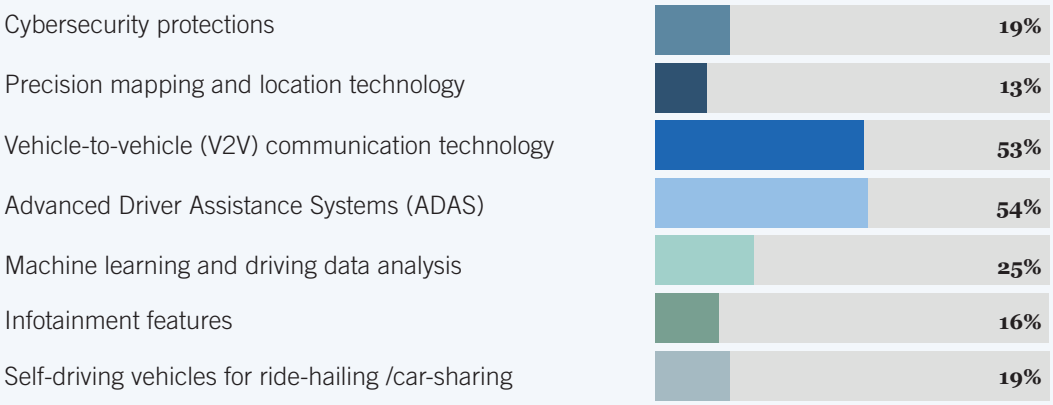


The majority of automakers and suppliers (56 percent) expect at least five percent of their companies' sales will come from connected cars and/or autonomous vehicle technology by 2025, with roughly half of those respondents (23 percent) anticipating such technologies will comprise 20 percent or more. Forty-one percent are developing these technologies because they believe it will help them remain competitive, without the expectation that it will increase sales.

In terms of competition in the connected cars and/or autonomous vehicles space, most traditional automakers and suppliers expect their primary competition to remain within the industry over the next three years. However, roughly a quarter expect their primary competition to come from nontraditional sources, namely technology startups (22 percent) or established tech companies (22 percent) – and these percentages will likely continue to grow looking beyond 2020. These responses indicate a relatively uncertain sense of where the competition will come from, or perhaps a recognition that competition is coming from all sides.

The following question was only answered by investors, automakers or suppliers.

14 IN WHICH OF THE FOLLOWING TECHNOLOGIES FOR CONNECTED CARS AND/OR AUTONOMOUS VEHICLES ARE YOU MOST INTERESTED IN INVESTING?



Traditional automakers, suppliers and investors identified a wide range of technologies in which they are looking to invest, another sign of the high level of interest in the connected cars and autonomous vehicles space.

Advanced Driver Assistance Systems (ADAS) emerged as the technology of most interest for investment (54 percent). Automakers and suppliers have increasingly looked to acquisitions and partnerships with technology companies developing ADAS technology, especially investments into ventures that improve systems such as monitoring, warning, braking and steering. ADAS will eventually lead to full autonomy as drivers become more comfortable with greater control by the vehicle.

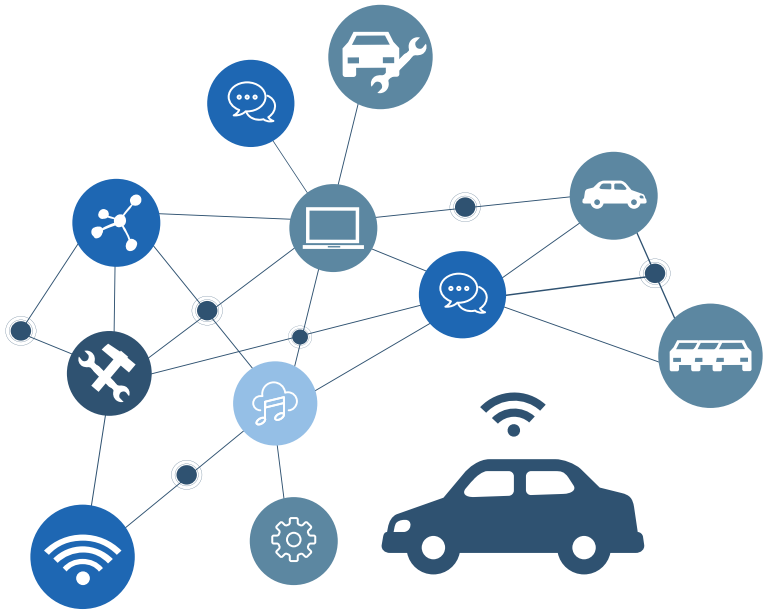
Identified earlier as a challenge area, V2V communication technology followed closely as a target area for investment (53 percent). Automotive companies, which have taken years to develop communications technologies such as Dedicated Short Range Communications, have stepped up their efforts in anticipation of the NHTSA's connectivity mandate.

Methodology and Demographics

Foley distributed this survey in the third quarter of 2017 and received responses from 83 automotive and technology executives. Sixty-two percent of respondents held C-suite titles (i.e., CEO, COO, Chairperson, etc.) or identified as Directors or Managers. Respondents were primarily based throughout the U.S. – including Michigan (30 percent), California (13 percent) and Massachusetts (13 percent) – and in Asia (14 percent).

The breakdown of respondents includes:

- Traditional Automaker / Supplier (35 percent)
- Startup Technology Company (13 percent)
- Large Technology Company (13 percent)
- Consultant / Advisor / Insurance Industry (13 percent)
- Investor (10 percent)
- Bank / Financial Institution (9 percent)
- Trade Association (4 percent)
- Other Professional (3 percent)



About Foley's Connected Cars and Autonomous Vehicles Group

Foley has the geographic reach and deep industry experience to help automotive and technology companies seize opportunities and manage risk in the new age of connected and autonomous vehicle transportation, with 17 domestic offices including Detroit, Silicon Valley, Boston and Washington, D.C. and international offices in Brussels and Tokyo. Foley is a global leader in advising automotive suppliers, OEMs, technology and emerging companies, as well as the private equity and venture capital providers who fund them, across the United States, Europe and Asia. The firm's multidisciplinary team of attorneys provides counsel on IP, data privacy and security, litigation, NHTSA and regulatory matters, as well as contract law, corporate finance, government and public policy support.

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Foley & Lardner LLP looks beyond the law to focus on the constantly evolving demands facing our clients and their industries. With more than 900 lawyers in 19 offices across the United States, Europe and Asia, Foley approaches client service by first understanding our clients' priorities, objectives and challenges. We work hard to understand our clients' issues and forge long-term relationships with them to help achieve successful outcomes and solve their legal issues through practical business advice and cutting-edge legal insight.
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