The cognitive effect on automotive

Unleashing exceptional experiences from an abundance of data

IBM Institute for Business Value

Executive Report

Automotive

How IBM can help

Today's vehicles are evolving from a mode of transport to also serve as a new kind of moving data center with onboard sensors and computers that capture information about the vehicle, its occupants and the environment. Using such real-time data, IBM helps auto executives provide new services that the connected consumer needs and expects from the vehicle experience. Our combined strength in manufacturing and depth of global automotive expertise can address consumer concerns about safety and quality. Innovative technologies such as Watson for analytic capabilities can meet OEM and supplier needs, including products and services that are more secure and reliable to enable higher brand loyalty and customer satisfaction. For more information, please visit **ibm.com**/industries/automotive/.

Exceptional enterprise and mobility experiences

The auto industry is going through unprecedented change – self-driving vehicles, electric cars and new mobility services have quickly evolved from visionary concepts into reality. And countless more innovations are on the horizon. Data is central to these innovations, providing potential insights that can help greatly enrich auto company enterprise and mobility experiences. Auto companies are turning increasingly to cognitive computing to unlock these insights, according to 500 auto executives who participated in our recent cognitive computing study. These executives indicate that the technology, their organizations and the industry are now aligned for cognitive computing adoption. There is a small group of cognitive innovators who are already investing more than their peers in cognitive computing and maintaining a focus on future growth, while paving the way for others to follow.

Driving growth through data

Automotive (auto) companies are sitting on a treasure trove of data – data generated by their businesses, products and services, customers and other external sources. The potential uses of this data are tremendous – from greatly improving industry and company practices to personalizing consumers' in-vehicle experiences to creating new mobility options.

But that potential often remains untapped because the tools to extract the insights residing within the data are either underutilized or unavailable. Cognitive computing can help unleash these insights – and auto executives are beginning to take heed.

To understand the potential impact of cognitive computing on the industry, we analyzed responses of 500 auto industry executives worldwide who participated in a 2016 IBM Institute for Business Value cognitive computing survey (see *Methodology* section at the end of this report).

We explored what auto executives say about how ready the technology,the industry and their organizations are for cognitive adoption; what their companies are currently doing with cognitive computing; and what they plan to do in the next few years. We also looked at a select group within the industry that is ahead of others in cognitive adoption to learn what they're doing differently, and at how digital business – business conducted by digital means – and digital intelligence – insights gained using digital technology – are merging to create exceptional enterprise and mobility experiences.

Why cognitive? Why now?

65 percent

of auto executives surveyed report their organizations derive value from structured and unstructured data.

More than 60 percent

of auto executives surveyed agree that cognitive technology is market ready, and their industry and organizations are ready to adopt it.

60 percent

of auto executives surveyed agree cognitive computing will be a disruptive force, and 53 percent say their organizations will invest significantly in it in the next three years.

Every day, nine billion gigabytes of personal data is generated and one million new active mobile users are added to social networks.[1] For auto companies, this data has significant potential for helping them create exemplary customer experiences and personalizing marketing campaigns.

The Weather Company currently controls three billion weather forecast reference points.[2] Auto companies could use this reference-point data to enable a vehicle to plan its own route, or a business could use it to avoid weather-related disruptions to supply or distribution channels.

The amount of data is only going to grow. By 2025, one million autonomous vehicles are predicted to generate and consume 4,000 gigabytes of data daily – data that could potentially help personalize customers' in-vehicle experiences.[3] To put this quantity into perspective, currently that's roughly equal to the amount of data 40 percent of the world's population generates every day.

However, much of this data is unstructured, complex and volatile – and traditional analytics only makes use of a fraction of it. To access the full spectrum of available data, and to translate that data into the insights that help drive future innovations, new capabilities are needed. And that's where cognitive computing comes in.

Cognitive systems can understand, reason, learn and interact much like humans do (see sidebar, "What is cognitive computing?"). By augmenting uniquely human strengths – such as imagination or abstraction – with cognitive strengths – such as natural language interaction or pattern identification – cognitive systems can create new partnerships between

humans and technology. They do so in part by drawing from other advanced technologies, such as artificial intelligence, natural language processing, deep learning and predictive analytics.

Auto companies are at a critical inflection point in their adoption of cognitive computing. According to auto executives in our survey, the technology is market ready, and the industry and their organizations are ready to adopt it (see Figure 1).

Figure 1
Auto executives indicate that the technology, the industry and their organizations are ready for cognitive computing
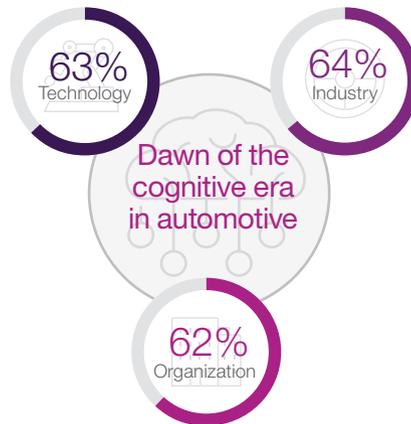
Source: IBM Institute for Business Value analysis.

What is cognitive computing?

Cognitive computing solutions offer various capabilities, including...

- Learning and building knowledge from various structured and unstructured sources of information

- Understanding natural language and interacting more naturally with humans

- Capturing the expertise of top performers and accelerating the development of expertise in others

- Enhancing the cognitive processes of professionals to help improve decision making

- Elevating the quality and consistency of decision making across an organization.

From a different perspective, survey responses of original equipment manufacturers (OEMs) and suppliers gave similar results: 66 percent of the OEMs and 61 percent of suppliers say cognitive computing technology is mature and market ready, while 69 percent of OEMs and 61 percent of suppliers say the industry is ready.

What's more, 68 percent of OEMs agree their organizations are ready to adopt cognitive computing compared to 58 percent of suppliers. And many plan to take action: 58 percent of OEMs say their organization is likely to implement it within the next three years compared to 41 percent of suppliers.

Outperforming companies – those that self-identified in our survey as high performers in terms of both revenue growth and profitability – are advancing even faster in cognitive adoption than the others in our survey, with 90 percent indicating their organization is ready for cognitive computing versus only 35 percent of the underperformers.

Auto executives are also optimistic about the role of cognitive computing in the industry's future. Sixty-seven percent of OEMs and 55 percent of suppliers say it will be a disruptive force within the next three years.

Innovation in the fast lane

While the majority of auto organizations report they are ready for cognitive computing, there are differences between OEMs and suppliers in their degree of cognitive adoption. Of the OEM executives surveyed, 73 percent indicated cognitive computing will be important to their organizations within three years, while 60 percent of suppliers concurred. Overall, OEMs are further along in their cognitive implementations as well, with 37 percent either piloting, implementing or operating cognitive systems in their organizations, versus only 14 percent of suppliers (see Figure 2).

Figure 2

OEMs are further along in their cognitive adoption than suppliers

Phases in adoption of cognitive technologies

■ OEMs ■ Suppliers
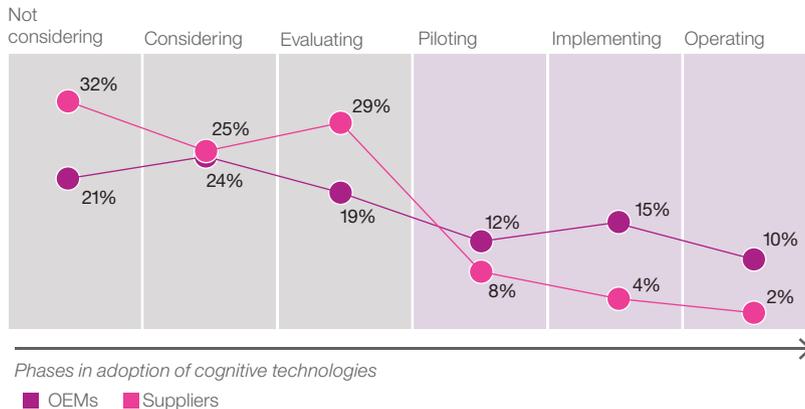
Source: IBM Institute for Business Value analysis.

To better understand which companies are leading in cognitive computing and what they're doing differently from others, we identified a subset of our respondents that ranked highest across five specific dimensions that exemplify cognitive innovation (see Figure 3). These "cognitive innovators" represent 12 percent of those surveyed.

Figure 3
Cognitive innovators ranked highest across five specific dimensions

5 building block dimensions

| Leadership in innovation | Familiarity with cognitive computing | Importance of cognitive computing in the organization | Industry readiness to adopt cognitive computing | Maturity in cognitive adoption |

Auto cognitive innovators

12%

61%
OEMs

39%
Suppliers
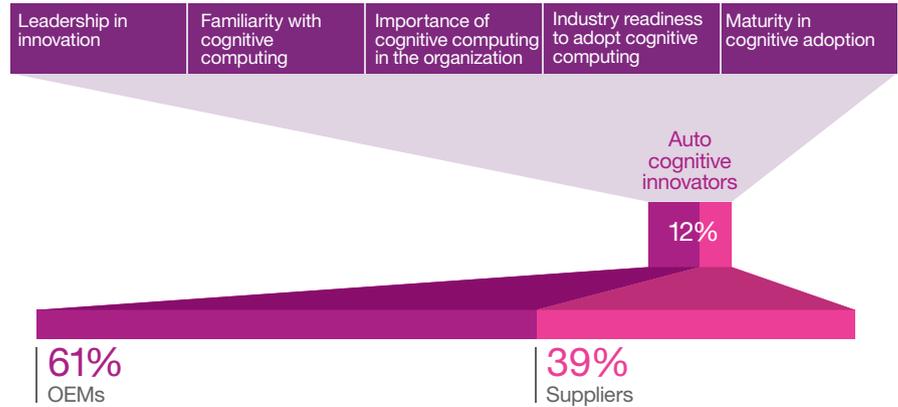
Source: IBM Institute for Business Value analysis.

We found that cognitive innovators excel at a number of important performance metrics. Forty-one percent are "outperformers" versus 10 percent of all others, and 98 percent said they grew revenue over the past three years compared to 53 percent of all others. Over the past three years, 95 percent said they were significantly more profitable than their peers versus 52 percent of others.

Cognitive innovators see growth as the primary objective of cognitive computing. They are implementing more rapidly than others and have greater expectations for return on their cognitive investments. Seventy-seven percent say they expect to implement cognitive systems within the next three years versus 57 percent of all others. And 51 percent expect a 20 percent or higher return on their cognitive investment compared to 26 percent of all others. Cognitive innovators also are taking a strategic approach and are further along in investing in cognitive technologies (see Figure 4).

Figure 4

More than 2.5 times as many cognitive innovators as others have a cognitive strategy in place today

Cognitive computing strategy exists in the organization

2.5X
more

48% | 19%
Innovators | Others

Investing significantly in cognitive computing today

2.2X
more

67% | 30%
Innovators | Others

Expect to be investing significantly in cognitive computing in 3 years

1.7X
more

82% | 49%
Innovators | Others
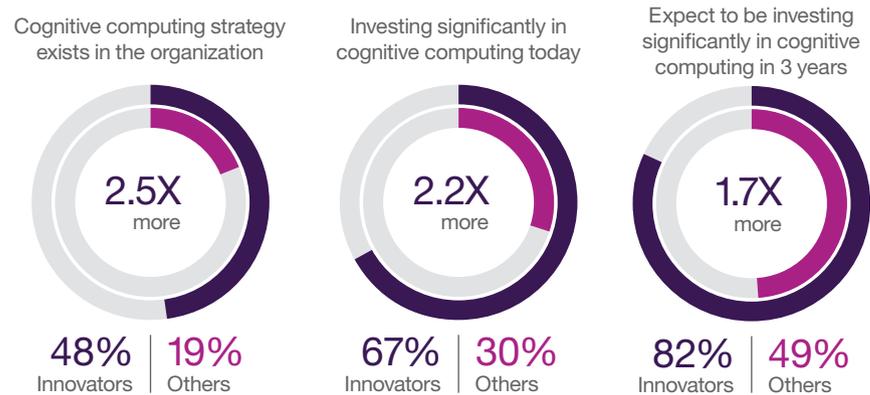
Source: IBM Institute for Business Value analysis.

Cognitive innovators understand the need to acquire and support cognitive skills and resources. Ninety-eight percent report that employee roles and skills will need to change, and 57 percent see lack of resources as a potential roadblock to cognitive adoption. Contrary to what might be expected, auto executives do not consider their customers or ecosystem partners to be barriers to successfully implementing cognitive solutions.

A cognitive automotive enterprise

Our research indicates that tomorrow's automotive disruptors are likely to be organizations that merge digital business with a new level of digital intelligence to create exceptional mobility experiences. Cognitive innovators understand the value of data. And they have the vision, data foundation and skills to discover that value through cognitive computing. Ninety-seven percent agree that their organizations derive value from structured and unstructured data compared to 60 percent of all others in our study.

For innovators, digital intelligence starts at the top with a clear view of what they want to achieve with their data and cognitive capabilities: 70 percent have a data and analytics strategy in place compared to 49 percent of others, and 64 percent have a chief data officer to oversee that strategy versus 43 percent of others. What's more, cognitive innovators have established a more mature data and analytics foundation: 67 percent use an enterprise-wide system for managing data versus 54 percent of others, and 57 percent have common data standards versus 42 percent of others.

In their investment in advanced data capabilities, cognitive innovators are far outpacing others. Sixty-three percent are investing in data analytics today compared to 31 percent of others. They also have a greater appreciation of the types of skills needed to improve their use of advanced analytics, such as advanced data architecture (62 percent versus 31 percent) and data acquisition (50 percent versus 32 percent).

The benefits of cognitive computing can occur across business units in the organization. Executives who oversee organizational functions – chief marketing officers, chief operating officers and the like – recognize these opportunities and the importance of cognitive computing across their organizations (see Figure 5).

Figure 5

Those who agreed that "Cognitive computing will be important for our organization"

73%
of strategy executives

71%
of information technology executives

65%
of customer-facing executives

63%
of operations executives

63%
of back-office executives
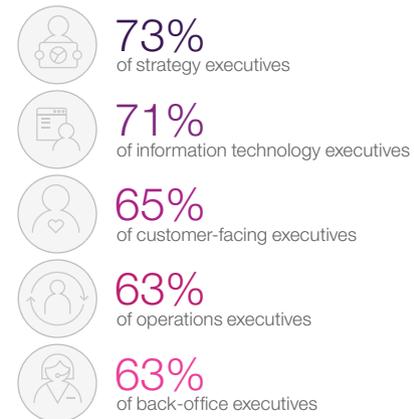
Source: IBM Institute for Business Value analysis.

Scenario: A vehicle that upgrades itself and gives engineers feedback

The owner of a vehicle has opted in to have the vehicle continuously analyze how it is being used. Based on insights from this analysis, the vehicle makes personalized recommendations for new functions and features as they become available. Through interactive dialog with the owner, the vehicle explains the new functionality and confirms the owner's understanding of how it works. If the owner decides to adopt the new feature, the vehicle downloads the software at a convenient time. Usage analysis is fed back to the automakers' engineers and designers who, in turn, apply it to developing new designs and functionality.

The value of cognitive computing within functions can best be illustrated with specific examples.

Creating lasting customer connections
A European automaker is improving marketing effectiveness by personalizing customer interactions using prescriptive insights. These insights, derived from data across the entire organization, provide a comprehensive view of the customer. Employees from companywide business units have access to the tools with which to analyze and extract insights. The company expects to see an increase in customer loyalty and higher sales revenues by building its brand around the globe.

Insights into production line adjustments
A European automaker analyzed more than 500 performance variables using predictive models to identify areas where the production line needed adjustment. Historical and real-time manufacturing variables, including machine setting, material temperature and equipment maintenance activities, contributed to a prediction engine for production line optimization. The company achieved 50 percent reduction in time required to attain optimal process target levels and 100 percent payback in two years.[4]

Risk avoidance through potential safety issue identification
A Japanese auto manufacturer identifies potential safety issues using advanced analytics that apply natural language processing to capturing and analyzing unstructured and structured data. The data reveals patterns and correlations between safety issues and root causes, allowing the automaker to find problems exponentially faster and more accurately.

An enriching mobility experience

Whether it's through personalized, in-vehicle experiences, new mobility services or future transportation options, cognitive computing can help create solutions that fit lifestyle preferences for moving around. In looking at cognitive innovators, we found they place greater importance on gathering multiple types of customer-related data from sources such as sensors and actuators, or still images and video.

Seventy-nine percent of them strongly agree that customer-generated text – from social media and other typed data sources – is important to collect compared to 51 percent of others. Similarly, 57 percent of cognitive innovators agree it's important to capture customer-generated data – from vehicle usage patterns, for example – versus 42 percent of all others.

Auto executives said cognitive computing will have a significant impact on the in-vehicle experience the self-enabling vehicle delivers. Eighty-seven percent of cognitive innovators in our survey agree with this versus 68 percent of others. This aligns with the area of most interest for consumers based on the results in our 2016 study, "A new relationship – people and cars: How consumers around the world want cars to fit their lives," in which 54 percent of consumers indicated they were highly interested in the experiences the self-enabling vehicle offers.[5]

Auto executives also report cognitive computing will play a significant role in the mobility services and transportation options people desire for moving from one point to another. Seventy-seven percent of cognitive innovators say cognitive computing will have a significant impact on the value mobility services provide to consumers and 69 percent of others agreed.

Scenario: Assessing, diagnosing and repairing damage from accidents

In a shopping center parking lot, a car hits and dents another car's driver-side door. The damaged car activates sensors and cameras to capture information about the car that hit it, as well as environmental conditions and damage done. After comparing the damage to similar cases, the car sends an assessment to its owner. The car communicates with the dealer to determine the cost of repair, and the availability of parts, technicians and appointment times. The vehicle also files the insurance claim and confirms the results with the owner for final approval. On the appointment day, the car drives itself to the dealership for repair.

Scenario: Fighting crime with cars

A major city's public safety department provides an opt-in service to allow it to use the cameras of civilians' cars during critical search and seizure situations. An incident occurs and the police issue an Amber Alert to locate the license plate of the suspect's car. Participating cars in the city's program receive the alert with a request for permission to use their cars' cameras to scan license plates. One car's scanner finds a match and transfers the location data to police. Other participating cars in the vicinity are notified and "keep eyes" on the suspect's car until police arrive.

This supports one of the primary growth strategies identified by 68 percent of auto executives who participated in our "Automotive 2025 – Industry without borders: Engage with consumers, embrace mobility and exploit the ecosystem" study.[6] As auto companies work to differentiate themselves to future consumers, cognitive mobility solutions are expected to play an important role in delivering exceptional experiences related to the brand – whether or not the person owns the vehicle.

Finally, auto executives indicate that cognitive technologies will address important top-of-mind consumer concerns. Seventy-seven percent of cognitive innovators and 71 percent of the others said cognitive technologies will have a significant impact on vehicle safety and the ability to save lives due to accidents caused by human error. In addition, 88 percent of cognitive innovators versus 69 percent of others indicated that consumer data security and privacy will be significantly improved.

There are many examples of mobility services that make use of cognitive computing today.

Intelligent concierge-style services
A European automaker in North America offers "intelligent" concierge-style services through a smartphone app that is integrated into its vehicles. In-vehicle services are personalized for the owner who can use them while in the vehicle or away from it. Route-time estimations, fueling, charging and finding parking spots, and coordination with other lifestyle events are just some of the features. The service continuously learns based on actions and preferences of the user. The experience configures to other like-model vehicles to allow for a consistent brand experience when car sharing.

Cognitive weather ads

A Japanese automaker is driving brand awareness and engagement for one of its models. The company is engaging and educating consumers using pop-up ads in a weather app. Instead of passively experiencing a brand's message, consumers actively engage with the ad to learn more about the vehicle on their terms. Users can get direct answers to their text and voice queries, and can be transferred to a local dealership. Machine learning provides deeper insights into the types of questions consumers ask.

Dynamic fare charging

A major on-demand ride-sharing provider is experimenting with alternative ways to calculate fares based on regional preferences. One option is to create a system that charges what customers are "willing to pay," based on factors like whether the customer is traveling to a wealthy suburb or past fares the customer has paid for similar trips. The company calculates fares using a "route-based pricing" strategy that involves a complex set of algorithms and takes into account the customer's spending habits. To understand route patterns and spending habits, the company incorporates artificial intelligence and machine learning. It also applies the data it collects from customers to make educated guesses about price sensitivity.

Becoming a cognitive innovator

Cognitive innovators make innovation core to their businesses, maintain a laser focus on issues and opportunities cognitive computing can address, and adopt an agile approach to execution. To aim for joining the ranks of cognitive innovators, auto executives can take specific actions:

Make innovation central to your business vision, strategy and execution.

- Embed and align innovation into your business and mobility strategy. Allow for future business model expansion and secure senior management buy-in.

- Establish clear processes and measures to facilitate and guide new innovations coming from inside and outside the traditional auto ecosystem. Obtain measurement buy-in from all participants.

- Encourage collaboration and co-creation with customers and ecosystem partners to develop new mobility products and services. Communicate about innovation initiatives.

Create a competency to clearly articulate automotive business and mobility opportunities that cognitive technologies can help address.

- Build a center of competence to identify business and mobility opportunities that can be addressed by cognitive technologies. Clearly define the scope of cognitive intervention.

- Develop a process to capture opportunity ideas from throughout the organization and through co-creation opportunities with customers and business partners. Communicate to all stakeholders.

- Evaluate and redefine the qualified opportunities to be addressed through cognitive computing. Articulate problems and continuously evaluate the selection process.

Define value associated with automotive business, employee and customer opportunities, and make the appropriate investments.

- Define the differentiated value cognitive computing brings very early in the process. Explore all possible opportunities and be realistic about benefits to be realized.

- Chart a course for cognitive investments, keeping in mind that cognitive systems are evolutionary by nature and benefits are incremental. Periodically validate actual versus expected benefits.

- Revisit and validate the investment strategy periodically. Adjust the strategy based on incremental benefits gained.

Ensure your data strategy targets information needed to address identified opportunities.

- Establish the data ecosystem – including customers, the business and mobility – that is needed to support cognitive systems. Also include the necessary infrastructure.

- Augment the ecosystem with new types and sources of data. Continually monitor customer preferences and make adjustments.

- Establish well-governed data curation services. Maintain strict governance on data administration and adhere to organizational policies.

Adopt an agile approach to execution.

- Define specific minimum viable products (MVPs). Identify scope, business use case and outcomes for the MVPs that can be transformed by cognitive technologies.

- Conduct rapid proofs of value (POVs) using an agile approach. Capture the data that supports the MVPs and validate iteratively to optimize the outcomes.

- Learn from the POVs and scale your findings to operationalize them for the business. Document learnings from the MVPs and enable solution rollout across the organization.

Related IBM reports

Stanley, Ben and Kal Gyimesi. "A new relationship – people and cars: How consumers around the world want cars to fit their lives." IBM Institute for Business Value. January 2016. http://www.ibm.com/services/us/gbs/thoughtleadership/autoconsumer/

Stanley, Ben and Kal Gyimesi. "Automotive 2025 – Industry without borders: Engage with consumers, embrace mobility and exploit the ecosystem." IBM Institute for Business Value. January 2015. http://www.ibm.com/services/us/gbs/thoughtleadership/auto2025/

Are you ready to start using cognitive technologies?

- How will you use cognitive technologies to create new enterprise and mobility experiences?
- In what ways will you verify that your data strategy targets the information necessary to address your cognitive opportunities?
- How can your organization collaborate with traditional and non-traditional auto ecosystem participants to implement cognitive technologies? How will you define and measure against agreed-upon success milestones?
- What can you do to get rapid paybacks from cognitive computing, and how will you build on early results for even greater returns over time?
- How will you "re-tool" your organization so that employees can discover new ways to perform their tasks while embracing cognitive capabilities?

Authors

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For more information

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IBM Institute for Business Value

The IBM Institute for Business Value (IBV), part of IBM Global Business Services, develops fact-based, strategic insights for senior business executives on critical public and private sector issues.

Methodology

For this report, we examined responses from 500 automotive executives who participated in the 2016 IBM Institute for Business Value Cognitive Computing Study. Participants represented companies worldwide in roles that spanned the C-suite.

500
participants

57%
Suppliers

43%
OEMs

North America
12%

Latin and
South America
8%

Western
Europe
14%

Eastern
Europe
17%

Middle East
and Africa
12%

China
17%

Japan
10%

Rest of
Asia Pacific
17%
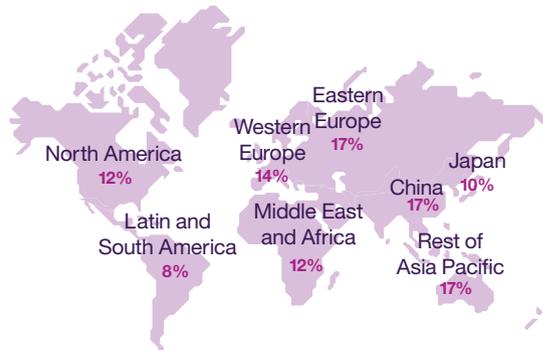
Notes and sources

1   Nelson, Patrick. "Just one autonomous car will use 4,000 GB of data/day." *Network World.* December 6, 2016. http://www.networkworld.com/article/3147892/internet/ one-autonomous-car-will-use-4000-gb-of-dataday.html; Smith, Kit. "Marketing: 96 Amazing Social Media Statistics and Facts." March 7, 2016. Brandwatch Blog. https:// www.brandwatch.com/blog/96-amazing-social-media-statistics-and-facts-for-2016/

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3   Nelson, Patrick. "Just one autonomous car will use 4,000 GB of data/day." *Network World*. December 6, 2016. http://www.networkworld.com/article/3147892/internet/ one-autonomous-car-will-use-4000-gb-of-dataday.html

4   IBM client analysis.

5   Stanley, Ben and Kal Gyimesi. "A new relationship – people and cars: How consumers around the world want cars to fit their lives." IBM Institute for Business Value. January 2016. http://www.ibm.com/services/us/gbs/thoughtleadership/autoconsumer/

6   Stanley, Ben and Kal Gyimesi. "Automotive 2025 - Industry without borders." (self-enabling cars) IBM Institute for Business Value. January 2015. http://www.ibm.com/ services/us/gbs/thoughtleadership/auto2025/