

Aaron Aboagye,
Aamer Baig,
Russell Hensley,
Richard Kelly,
Asutosh Padhi, and
Danish Shafi

FACING DIGITAL DISRUPTION IN MOBILITY AS A TRADITIONAL AUTO PLAYER

December 2017

OEMs and suppliers can compete—but it won't be easy. Focusing on four dimensions will be crucial.

Disruption lies ahead for the auto industry. Significant changes in consumer behavior—namely, a much greater focus on the in-vehicle experience rather than the driving experience—will almost certainly upend the status quo. Specifically, original equipment manufacturers (OEMs) and major (tier-one) suppliers will need to transform their products, as well as their capabilities and organizational structures, to survive and thrive. These changes present both great risk and great opportunity for the auto industry: while we expect the overall value pool to grow to \$6.6 trillion in 2030 from \$3.5 trillion today, traditional technologies and business models are expected to decline from 98 percent of the market today to 50 percent in 2030. Growth will be driven by disruptive technologies and business models in autonomy, connectivity, electrification, and vehicle sharing. To survive and thrive in this changing environment, auto industry incumbents will need to excel across four dimensions:

1. Owning critical control points within the ecosystem
2. Mastering data monetization for both revenue and cost
3. Enabling agile and two-speed R&D
4. Fully adopting Industry 4.0

The shifting terrain

Global auto profits are at an all-time high; indeed, OEM core-automotive operating profits reached \$125.4 billion in 2016, with an industry operating margin of 7 percent. However, the industry is highly dependent on just two markets, as three-quarters of these profits are concentrated in China and North America. Many auto insiders are now asking: has the industry peaked?

While personal mobility has brought enormous value to society and enabled profound progress over the past 130 years, there is still room to advance, particularly regarding utilization, efficiency, and safety.

Furthermore, the traditional rules of competition are rapidly changing, as recent investments highlight players' desire to build future auto capabilities. Over the past five years, we witnessed significant investment in four emerging technology-driven trends—autonomy, connectivity, electrification, and, more recently, shared mobility. Since 2010, these four areas have seen \$111 billion in disclosed external investments. And technology players are far ahead of OEMs. In just the past three years, the top four OEMs have completed 25 transactions in these areas, but the top two technology players have completed 170 transactions, mostly focused on building out capabilities. To remain competitive in an increasingly crowded and fast-moving space, incumbent auto companies will need to fundamentally reinvent both their product and technology offerings and their business models.

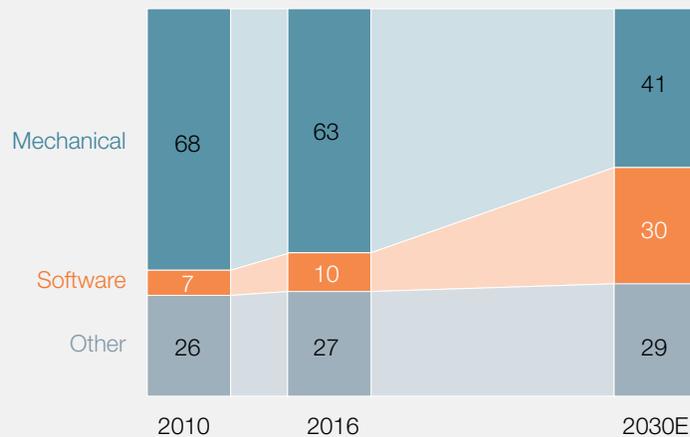
A decade ago, the automotive version of the “killer app”—the determining factor in purchase—was driving experience. Today, the killer app of driving has become the in-vehicle experience: demand for autonomous, connected, electrified, and shared solutions such as self-driving, networked parking service, over-the-air updates, early recall detection, cybersecurity, and targeted advertising. Case in point: McKinsey's Future of Mobility Survey found that 86 percent of consumers would switch vehicles to get some form of an advanced driver-assistance system (ADAS). And in the McKinsey Connectivity and Autonomous Driving Consumer Survey, 37 percent of respondents said they would switch to another manufacturer if it was the only one offering a vehicle with full access to applications, data, and media.

To enable this in-vehicle experience, the industry will need to shift its focus from a hardware-driven product to a software-driven product. Indeed, the role of software has increased and will continue to grow dramatically; we estimate that software will account for 30 percent of total vehicle content by 2030, up from about 10 percent today (Exhibit 1).

Exhibit 1

We expect software to account for nearly 30% of total vehicle content by 2030.

Average vehicle content, %¹



¹ Figures may not sum to 100%, because of rounding.

McKinsey&Company | Source: McKinsey Center for Future Mobility

Future scenarios of personal mobility suggest a dramatic shift toward disruptive technologies and business models. We estimate that 50 percent of the industry's expected \$6.6 trillion in revenues in 2030 will come from disruptive technology or business models—an exponential increase over today. Indeed, we expect the vast majority of the industry's growth to come from these disruptive technologies and business models, while the contributions of traditional technologies and business models will remain flat. Given this impending paradigm shift, OEMs will need to evolve in everything from R&D to sales to survive.

Four dimensions to compete in mobility's digital disruption

The emerging trends outlined above will combine with new technologies, changing consumer preferences, and new players to fundamentally alter the relationship between consumers and the automobile. To survive this disruption, industry winners will need to excel at the following four imperatives.

Owning critical control points within the ecosystem

As with other disruptions, we expect to see a redistribution of profits between segments and players within the auto industry. History has shown that in times of disruption, the highest profits tend to accrue to the owners of critical control points. Auto-industry players need to stake a defensible position and own critical control points—the elements of the value chain that have the greatest impact on product and service features that customers care about the most.

To get started, each player must evaluate scenarios with varying technology and market dynamics to identify the most attractive domains (for example, ADAS, powertrain, infotainment, chassis, or in-vehicle networking) based on several factors, including profit-pool size, the capabilities required to win, and the ability to create a sustainable advantage. And once the vehicle-domain priorities are set, players must determine the optimal access model for each layer in the stack—the cloud, applications and user interface (UI), middleware and services, operating systems, visualization, and hardware.

For example, in infotainment, UI and cloud content will have a significant impact on user experience and therefore will emerge as the primary control points. Meanwhile, in ADAS, cloud content (for high-definition mapping, with a direct impact on ADAS effectiveness and user experience), algorithms (which directly affect driving experience), and sensors (which are essential for accurate perception and improved driving experience) are likely to be the critical control points.

Mastering data monetization for both revenue and cost

The auto industry is witnessing a dramatic increase in both the amount and diversity of data generated and collected from vehicles. Today, vehicles generate 25 gigabytes of data per day, mostly internal telematics and engine control-unit data. The autonomous car of tomorrow will record anything and everything it can—Intel estimates that this could amount to 4,000 gigabytes of data per day.¹

This data will be applied to a wide range of use cases, which will represent new potential sources of value for the industry. In sum, these data-enabled monetization opportunities could generate as much as \$750 billion in value by 2030.

Opportunities for auto players will come from monetizing rich data sets for business-to-business customers and for individual consumers. Vehicle data can be used, for instance, to create targeted paid content or advertisements, say, in maps around points of interest. Autonomous vehicles in fleets can be programmed to achieve fuel savings of 3 to 5 percent simply by coasting while approaching red lights. For consumers, convenience is king. Automatic searches, concierge services (including the ability to make reservations), and advanced payment for parking are all examples of promising use cases for consumer-direct monetization opportunities.

To succeed in capturing both B2B and B2C opportunities, auto players will need to identify which alternative monetization models best suit their strengths. They will also need to overcome key challenges related to data ownership, use cases, cross-functional execution, pricing models, big data and advanced analytics, and data security.

Enabling agile and two-speed R&D

Historically, R&D at auto companies has followed a linear, hardware-driven approach. With software content in vehicles increasing, this is unlikely to be sustainable. Additionally, talent

¹ Katie Burke, "Auto industry braces for massive influx of data," *Automotive News*, September 7, 2017, autonews.com.

access will be a challenge: the industry will need three times as many software engineers in 2030 as it required in 2016.

To become credible software players, auto players will need to adopt an agile software-development approach similar to what tech players have adopted and scaled across their development teams. In automotive, agile software development significantly shortens the development cycle to 6 to 24 months, compared with the 50 to 60 months required in traditional R&D. It also enables players to distinguish between the features required at launch and the features that can be delivered postlaunch through over-the-air updates or other means. This distinction and flexibility minimize the risk of the software being a launch bottleneck and enable a more dynamic customer experience.

While the agile methodology provides significant performance advantages, it creates inherent conflicts with the traditional automotive hardware-development model. Given these ingrained differences, organizations will have to prepare for and embrace “two-speed R&D,” with these two very different but tightly linked hardware- and software-development lanes running in parallel.

To attract developers in this environment, auto players will need to adopt a start-up-like approach to hiring and retaining talent. Software managers and not HR would be better placed to manage recruiting. The work environment (and possibly location) should be set up to be attractive and compete with top tech players. Auto companies should also be on the lookout for opportunities to acquire talent.

Finally, auto players will need to look at artificial intelligence and automation in software development to ensure that valuable and scarce software developer time is being spent on high-value-add, specialized activities. This could generate 30 to 50 percent additional development capacity.

Fully adopting Industry 4.0

Industry players must sustain and grow productivity, quality, and operational agility through digital best practices. The automotive industry has demonstrated impact from techniques such as lean and Six Sigma, but Industry 4.0 offers the potential to improve productivity by another 20 percent through a broad set of levers applied not only within the four walls of plants but across the extended value chain. These opportunities are not hypothetical; they are in use today and can be easily accessed without significant capital expenditure.

For example, one automotive OEM found that applying Industry 4.0 principles helped it to achieve transformational impact on a mature production process it had considered already optimized. By applying advanced analytics and in-line automated quality management to a metal-machining process, it boosted overall productivity by more than 30 percent, reduced scrap by 80 percent, and shortened process time by 50 percent. The company fitted computer-numeric-control machines producing crankshafts with Internet of Things sensors to extract and monitor performance data and developed an algorithm to analyze this data in real time to detect and immediately correct quality deviations. In addition, it analyzed the data to optimize tool positioning to increase throughput.

Still, many companies have struggled to translate early proofs of concept into substantial bottom-line impact. Our research shows four pillars are key to achieving full impact from Industry 4.0. One, the approach: target game-changing impact rather than incremental improvements. Two, the objective: focus on fundamentally changing or eliminating work rather than making it more efficient. Three, the mind-set: think like a tech entrepreneur, not a large corporation. Four, the implementation: approach the effort as you would an agile digital transformation rather than by following a lean or enterprise-resource-planning playbook.



Aaron Aboagye is a partner in McKinsey's New Jersey office, **Aamer Baig** and **Asutosh Padhi** are senior partners in the Chicago office, **Russell Hensley** is a partner in the Detroit office, and **Richard Kelly** is a partner in the Stamford office, where **Danish Shafi** is a consultant.

The authors wish to thank Bo Bushong, Ryan Fletcher, Moritz Rittstieg, and Andrew Seay for their contributions to this article.