Predicts 2016: Automobiles Become Digital Endpoints in the Era of Smart Mobility

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New business opportunities, looming disruption and growing technology requirements are leading to a renaissance of the automobile. Automakers and technology companies are in a race for leadership with software-defined vehicles in the era of smart mobility.

Key Findings

- Automotive organizations have the opportunity to become digital business creators by embodying four smart mobility competencies, or else they become digital business participants.

- By the end of the decade, 80% of all new vehicle models in mature markets will have data connectivity; 30% of connected-vehicle models will have built-in, function-level, over-the-air software update capabilities.

- Industry disrupters will offer self-driving vehicle technology in automobiles as a standard feature and foundation for more profound smart mobility innovations centered on the customer.

- On-demand mobility offerings are challenging traditional automotive business models by replacing aspirational car ownership with indifferent obtainability.

Recommendations

CEOs and CIOs at automotive and technology companies should:

- Change your view on self-driving technology from being a unique halo feature for a limited number of models to an enabling technology that will become a foundational characteristic of all your products and brand identity.

- Develop a dual business model portfolio that addresses consumer preferences for traditional vehicle ownership, as well as intuitive on-demand mobility solutions.

- Deploy IoT, LBS, AI, mobile device, analytics and big data insights to optimize your smart mobility solutions and make your offers easy, timely and intuitive to use.
Invest in best-in-class cybersecurity approaches, designs and solutions at the component, vehicle, cloud and data transport level. A 100% cybersecurity-proof connected platform doesn’t exist, so it is paramount to enable software update capabilities to address issues that arise.

**Strategic Planning Assumptions**

By 2020, a vehicle with over-the-air software update capabilities will generate 20% of its total profit after its sale.

By 2020, three automotive companies will offer self-driving vehicle capabilities as a standard feature.

By 2020, 10% of today’s vehicle owners in mature urban markets will replace vehicle ownership with on-demand vehicle access.

By 2019, two automotive companies will be fined for vehicle software design negligence, resulting in inconsistent technology performance or cybersecurity attacks.

**Analysis**

**What You Need to Know**

The automotive industry’s digital journey to the era of smart mobility, as well as the software-defined and technology-defined automobile, continues. By leveraging digital business principles that center on converging an automobile’s physical benefits with virtual value propositions, automotive companies can realize unprecedented business opportunities. The creation of new connected-vehicle and smart mobility offerings will inspire established and new automotive companies to combine and converge a product-focused approach with one centered on the customer’s digital lifestyle. This will ultimately pave the way for automotive companies to actively create industry convergence through the redefinition of industry boundaries by shifting the focus from individual products to cross-industry value experiences (see "Industry Convergence — The Digital Industrial Revolution").

The extent to which automotive and technology companies will benefit from these new digital opportunities depends on their ability to embrace the following four smart mobility competencies:

- Foster creativity by looking to adjacent sectors and value propositions that are closely associated with the automobile and mobility (for example, in-vehicle payments for goods and services).
- Leverage technology across all customer touchpoints with a clearly defined value proposition. These touchpoints are not only being developed internally, but also with the help of existing and new business partners representing digital domains.
Develop digital business readiness in your organization to ensure a continued focus on superior product development and — at the same time — to allow for new input on product and service innovations via digital assets.

Create a new ecosystem strategy that centers on collaboration, co-creation and investment activities, including venture funding, mergers and acquisitions. Also include new partnership activities between the automotive and technology industries that lead to innovations inside and outside of the automobile.

Organizations that master these smart mobility competencies will become digital business creators: companies that will have transformed into technology-centric businesses that deeply embrace digital value experiences in all their products, services, interactions and business model aspects. This will provide additional and new opportunities for revenue generation, diversification and growth.

Those organizations that will not be able to succeed with these competencies will become digital business participants: companies that will continue to operate primarily as traditional, best-in-class, product-centric companies that let partners (or competitors) manage most (if not all) aspects of new digital business value propositions. This will limit existing and new opportunities for companies to expand business models, revenue and growth opportunities.

CEOs in automotive organizations must decide, over the next two to three years, which group they will want to join, because market realities and competitive forces will constrain a company’s options after that.

Strategic Planning Assumptions

**Strategic Planning Assumption:** By 2020, a vehicle with over-the-air software update capabilities will generate 20% of its total profit after its sale.

*Analysis by:* Thilo Koslowski

**Key Findings:**

- The leading global vehicle manufacturers are embracing in-vehicle connectivity across their entire model lines. By the end of this decade, about 80% of all new vehicle models in mature automotive markets will have built-in data connectivity.

- Increasingly, the automotive industry is expanding its expertise in software and technology hardware development to create new in-vehicle electronic engineering architectures for future vehicle models. This will lead to update capabilities for hardware and over-the-air software.

- By the end of this decade, approximately 30% of connected-vehicle models will have built-in, function-level, over-the-air software update capabilities This will enable automakers and their business partners to activate, expand and/or update new functions and features of the automobile after the vehicle has been sold and is already in use.
U.S. (40%) and German (14%) vehicle owners who use their cars on a regular basis indicate that they are rather likely to pay for a service that automatically upgrades the software in their automobiles every 18 months (based on data Gartner collected and analyzed in 4Q15).

U.S. (32%) and German (11%) vehicle owners who use their cars on a regular basis indicate they are rather likely to pay for the option of upgrading the hardware in their automobile every three years (based on data Gartner collected and analyzed in 4Q15).

**Market Implications:**

The development of connected vehicles, in combination with new electronic architectures and over-the-air software update capabilities, will redefine product life cycle opportunities in the automotive industry. It will expand the century-old business model of realizing profits predominantly at the point of sale, with some limited sales potential during the after-sales phase (service/parts/accessory) to an upsell opportunity for new functions, features and services throughout the product’s life cycle.

This change will allow automakers and their partners, including suppliers, technology companies, content/service providers and dealers, to:

- Strengthen and refresh the appeal of the automobile’s product and create a stronger customer bond (for example, users can experience new safety or automation features on a daily basis, thereby re-emphasizing their purchase decision and satisfaction).
- Increase the residual value of automobiles with refreshed technologies that will improve companies’ remarketing business (for example, increasing the value of off-lease and preowned vehicles for financial services organizations).
- Better leverage economies of scale, resulting in lower costs for technology components in automobiles by installing them in all vehicles but activating them only after a software update and the additional purchase of the function have been completed by the user (for example, installing sensors on all vehicles but only activating them after the customer has purchased an upgrade package).
- Give automotive companies the opportunity to start exploring data-related business and user value propositions by analyzing feature/function usage and insights (for example, collecting data from self-driving vehicles to create highly detailed map information).
- Expand the role of automotive dealers to provide technology and feature update demonstrations and support (for example, by providing upgrade modules and hands-on training on how to get the most from the features).

**Recommendations:**

CEOs, CIOs, connected-vehicle and technology executives at automakers, suppliers, and technology and service providers:

- Develop in-vehicle technology platform architectures that can allow for hardware-level and software-level updates and function/feature activations. Bring together expertise from electrical engineering and IT departments to create an IT/OT infrastructure that can enable such updates.
Redefine the automobile’s product life cycle at the engineering/development, marketing/sales and CRM levels. This includes reconsidering product and business revenue generation over the course of an automobile’s life span.

Invest in best-in-class cybersecurity approaches and designs at the component, vehicle, cloud and data transport level. Work with expert vendors that can validate and monitor your efforts independently.

Establish new product life cycle management (PLM) processes and capabilities that allow you to master software development in your organization successfully. That means expanding your focus on PLM vendors with specific expertise in software design and management — which few traditional PLM vendors that focus on the automotive industry have today.

Related Research:

"Hype Cycle for Connected Vehicles and Smart Mobility, 2015"

"Master the Four Stages of Connected-Vehicle Evolution to Lead the Renaissance of the Automobile"

"Harman Sets Foundation for New Automotive Supplier Model"

Strategic Planning Assumption: By 2020, three automotive companies will offer self-driving vehicle capabilities as a standard feature.

Analysis by: Thilo Koslowski

Key Findings:

- Technology advancements in processor, sensor, software, cloud, machine learning and data (such as maps) capabilities for self-driving vehicle applications continue to evolve rapidly.

- Key automotive and technology companies continue to expand their investments and resource allocations in self-driving vehicle technologies, as evidenced by product advancements from Intel, Nvidia, Bosch, Continental, ZF, Google, Delphi, Mobileye, Nokia Here, Quanergy Systems, Audi, BMW, Daimler, Volvo, GM, Ford, Honda, Toyota and others.

- The combined emergence of self-driving vehicle capabilities and in-vehicle and intervehicle connectivity, as well as electro mobility, will motivate existing and new companies, in particular, to launch innovative automobiles that break new ground.

- U.S. (27%) and German (12%) vehicle owners who drive their cars on a regular basis would definitely consider buying a self-driving vehicle for themselves or their household. U.S. (41%) and German (52%) vehicle owners might consider it, and 32% of U.S. and 36% of German vehicle owners would not consider it (based on data Gartner collected and analyzed in 4Q15).
Market Implications:

The emergence of self-driving vehicle technology as a standard function in a new automobile will be disruptive for the automotive industry and will force companies to reconsider their product, launch and monetization strategies for the technology. Even though these standard self-driving vehicle offerings could initially be limited to automated driving capabilities, rather than full autonomous or driverless modes (see "Maverick* Research: Crashing Industries and Our Societal Beliefs — The Real Implications of the Autonomous Vehicle"), the market implications will be significant nonetheless:

- Especially new, emerging automotive companies will use the technology in combination with others (such as an electric powertrain) to define new product and brand values that will instantly differentiate them from other, mostly established, companies.
- The self-driving technology itself will become commoditized more quickly, which will make it more difficult for other companies to charge premiums for it.
- Companies offering self-driving vehicle capabilities as standard options will use a strategy of after-the-sale profit opportunities to improve and expand the technology’s functions and features; for example, by improving the technology’s use on a broader road infrastructure or by increasing the speed at which it can operate (see the first Strategic Planning Assumption).

Recommendations:

CEOs, CIOs, connected-vehicle, advanced driver assistance systems (ADAS) and technology executives at automakers, suppliers and technology companies:

- Prepare for business disruption from companies that will offer self-driving vehicle technology and challenge your product strategy. Consider your options for speeding up the launch of the technology in your products (for example, limited capabilities versus best-in-class functions) and for keeping costs down (for example, by partnering with other companies to share investments and/or leverage existing expertise).
- Change your view on self-driving technology from being a unique halo feature for a limited number of models to an enabling technology that will become a foundational characteristic of all your products and brand identity.

Related Research:

"Hype Cycle for Connected Vehicles and Smart Mobility, 2015"

"Nokia Here Acquisition Protects Group’s Innovation Leadership — For Now"

"Innovation Insight: The Connected Vehicle Will Dominate Automotive and Mobility Innovations"

Strategic Planning Assumption: By 2020, 10% of today’s vehicle owners in mature urban markets will replace vehicle ownership with on-demand vehicle access.

Analysis by: Thilo Koslowski
Key Findings:

- The global expansion of on-demand vehicle offerings is increasing the number of consumers who are experiencing these services.
- The growing integration of such offerings in mobile applications and platforms (for example, Uber's integration into OpenTable) is creating a convenient "one-click" experience for users.
- Growing startup funding and the use of such funds for investments in location-based service (LBS), mapping and autonomous vehicle technologies will further lead to the development of end-to-end mobility solutions for users’ transportation needs.
- Traditional automakers are expanding their strategies with smart mobility offerings that include alternatives to traditional vehicle ownership (such as Daimler’s car2go and Audi on demand).
- U.S. (33%) and German (39%) vehicle owners interested in getting a self-driving vehicle in the future indicate that they are very or extremely likely to forgo buying or leasing an automobile if they could instead subscribe to a service that offers access to self-driving automobiles whenever they needed one (based on data Gartner collected and analyzed in 4Q15).

Market Implications:

A decline in automotive ownership will put market pressure on the automotive industry, especially when combined with cyclical sales trends. This will force automakers to diversify their business model and expand their strategic considerations by developing smart mobility solutions focused on providing vehicle access in addition to vehicle ownership:

- From a marketing and demand perspective, this change means that for some consumers, aspirational vehicle ownership will be replaced by indifferent obtainability of transportation.
- Offering on-demand transportation services requires different financial evaluations of assets and revenue generation and realization over a longer time frame, compared with point-of-sale revenue recognition.
- Dealerships, especially those in urban centers, could become a valuable location asset in providing vehicle access, maintenance and customer service for on-demand mobility services.

Providers of new mobility solutions will have the opportunity to solidify their value propositions when consumers make the decision to permanently give up ownership in response to new on-demand offerings. This will strengthen existing on-demand mobility companies’ business objectives and create interest from new organizations to develop offerings in this space.

An increase in customers forgoing vehicle ownership for vehicle access will also impact city planners and legal councils, which will need to explore how to accommodate such new offerings. For example, as consumers give up vehicle ownership, cities will need to provide extra and conveniently located parking spaces for shared automobiles, as well as similar privileges for on-demand vehicle services that already are offered to other public transportation services (such as passenger pickup at airports).
Recommendations:

CEOs, CIOs, smart mobility executives at automakers and on-demand mobility solution providers:

- Develop a dual business model portfolio that addresses consumers' traditional vehicle ownership, as well as on-demand mobility solutions. Realize that the initial number of consumers giving up car ownership over the next five years will be low but can increase quickly once sufficient offerings are being developed.

- Leverage IoT, LBS, AI, mobile device, analytics and big data insights to optimize your smart mobility solutions and make your offers easy, timely and intuitive to use.

Related Research:

"Hype Cycle for Connected Vehicles and Smart Mobility, 2015"

"Cool Vendors in Automotive and Smart Mobility, 2015"

"Uber Shifts Lanes, Aims to Pass Automakers Through Technology"

Strategic Planning Assumption: By 2019, two automotive companies will be fined for vehicle software design negligence, resulting in inconsistent technology performance or cybersecurity attacks.

Analysis by: Thilo Koslowski

Key Findings:

- Complexity levels for in-vehicle electronics are growing significantly as companies offer more and often new ADAS, connected-vehicle, smart mobility and electric vehicle features in the majority of their vehicles.

- Especially self-driving vehicle features will be scrutinized in the future regarding the ability to alter their performance via software and hardware hacking, as well as how they are performing versus what end users were expecting. For example, the first autonomous vehicle deployments will not allow drivers to divert attention to the actual operational aspects of driving, so that they can take over the wheel in case the vehicle malfunctions.

- Many established automakers are using in-car electronic architectures that have previously been developed for less complex vehicles. This makes it more challenging to add additional capabilities over time and ensure the highest levels of cybersecurity and feature performance compared with new architectures.

- The emergence of over-the-air software update capabilities, in combination with the desire to emphasize technology leadership, is resulting in a race for launching new product features. This carries the risk of overpromising capabilities and being out of sync with consumers' expectation of the technology's abilities.
Public institutions and representatives are increasing their awareness and oversight regarding in-vehicle, technology-related cybersecurity issues. This is likely going to expand into a focus on described versus actual versus expected feature functionalities.

**Market Implications:**

More scrutiny for potential automobile-related cybersecurity and feature performance levels will put pressure on automakers and their suppliers to develop comprehensive electronic engineering architectures and approaches. This means that companies will have to consider these aspects comprehensively in the development and engineering of new technology-enabled capabilities — both in terms of vehicle-related design aspects and infrastructure-related considerations, including cloud, network and data aspects.

Furthermore, companies must ensure that their marketing efforts clearly communicate precisely what new technology features can and cannot do. This should also include restricted use of the technology under certain circumstances, such as limiting an automated driving feature when it is used outside of a highway setting by identifying inappropriate road usage via GPS locations.

Due to the increase of software, hardware and wireless data usage in automobiles, the role of vendors and experts specializing in cybersecurity and electronic architectures will continue to grow in the automotive supply chain — during and after the development process of automobiles. For example, some automakers and industry consortia have begun creating dedicated roles and efforts to address cybersecurity holistically (for example, GM's chief security officer [CSO] and Intel's Automotive Security Review Board).

**Recommendations:**

CEOs, CIOs, CSOs and electrical engineering leaders at automakers, suppliers and technology providers:

- Proactively seek to establish industrywide guidelines and best practices for avoiding and addressing potential cybersecurity issues. A 100% cybersecurity-proof connected platform doesn’t exist, and therefore it is paramount to enable software update capabilities to address issues as they arise.
- Work closely with public agencies to leverage government efforts regarding cybersecurity and technology performance validation and guide them in the right direction where such help is most needed.

**Related Research:**

"Authentication in the Internet of Things"

"Hype Cycle for Connected Vehicles and Smart Mobility, 2015"

"Forecast Analysis: Internet of Things, Endpoints and Associated Services, Worldwide, 2014 Update"
A Look Back

In response to your requests, we are taking a look back at some key predictions from previous years. We have intentionally selected predictions from opposite ends of the scale — one where we were wholly or largely on target, as well as one we missed.

On Target: 2013 Prediction — By 2016, autonomous vehicle technology leadership will shift from sensor capabilities to highly detailed, rich map data and network-centric cloud computing innovations (see "Predicts 2014: Automotive Companies' Technology Leadership Will Determine the Industry's Future").

Over the last three years, automotive and technology companies have increased their activities around self-driving vehicle technologies, specifically map data and cloud computing innovations. Organizations are recognizing that sensor and machine learning capabilities — while being critical components — are not sufficient for the realization of self-driving vehicles. Instead, companies understand that access to highly detailed map information, in conjunction with the use of cloud computing for the collection, distribution and analysis of relevant information, is becoming a more difficult asset to own and control. A stark example of this recognition is the acquisition of Nokia’s Here map and LBS business by a consortium of Audi, BMW and Daimler for 2.8 billion euros in August 2015 (see "Nokia Here Acquisition Protects Group's Innovation Leadership — for Now").

Missed: 2007 Prediction — Starting in 2009, vehicle manufacturers and suppliers seeking leadership in the vehicle ICT space will focus efforts on creating converged services that connect the vehicle with the home and office (see "Predicts 2008: Convergence Defines Auto Companies' Innovation Power").

We only partly missed our prediction from 2007 by underestimating how long it will take the automotive industry to begin embracing connected-vehicle efforts in the broader context of connecting with the home and office space. Instead of reaching this point in 2009, it took the automotive industry one year longer to start understanding the connected vehicle as an element in consumers' connected lifestyles. The 2008 global economic downturn forced automotive companies to focus most of their efforts on the core business of manufacturing and selling cars profitably, which delayed other strategic efforts. Additionally, consumers — including people working in the automotive industry — had to better understand what defines their digital lifestyles due to increased usage of smartphones and the mobile Internet. In 2015, the focus on car-to-home innovations has gained attention from various automakers and technology companies (such as Nest). This area will see continued focus over the next three years.

Gartner Recommended Reading

"Industry Convergence — The Digital Industrial Revolution"

Evidence

In a representative study conducted and analyzed in the third and fourth quarters of 2015, Gartner surveyed 2,053 consumers in the U.S. and Germany, establishing country quotas to ensure
nationally representative distributions of the online populations in respect to gender, age, region, income and car ownership/regular driving.
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