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Research Design Case Study: The Ford Motor Company and Autonomous Car Adoption

Challenge

In a world of climate change, growing population, rapidly developing technologies, and the need for mobility, it seems as if autonomous cars are the way of the future. Automakers, communications companies, and navigations systems companies are all developing products to make cars safer, more efficient, and more environmentally friendly so the competition in this area has already started.

Google has been testing its fleet of self-driving Prius and Lexus cars since 2010. Google recently signed a deal with Continental AG, a German auto parts manufacturer, with connections to all the major automakers. Continental recently signed a deal with Cisco Systems to create a "connected car."¹⁸ Google's LIDAR (Light Detecting and Ranging) software costs approximately \$150,000 each and Google is working to bring down that cost. Google plans to debut its prototype to the public in 2016¹⁶.

Audi, BMW, GM, Nissan, Toyota and Volvo all have announced plans to unveil autonomous cars by 2020⁹. Mercedes-Benz debuted its S 500 Intelligent Drive Autonomous car at the September 2013 Frankfurt Auto Show anticipated for sale in 2020 for \$92,000.

Many cars already feature partially automated driving and active safety features in them such as adaptive cruise control, lane assist technology, forward collision warning, and back-up cameras. Toyota debuted self-parking cars in 2005¹⁶ and their vehicle-to-vehicle communication (V2V) system, called Cooperative-Adaptive Cruise Control (C-ACC) in which cars can share data regarding speed, acceleration, and braking from as far as ¼ mile away in 2013⁵⁸. Volvo keeps the driver alert with cameras, lasers and radar to monitor the car's progress. If a pattern emerges indicating that the driver might be tired, the dashboard flashes a steaming coffee cup and the words "Time for a break¹⁶." Mercedes' advanced cruise control will not even work unless at least one of the driver's hands is on the steering wheel¹⁶.

Only California, Nevada, Michigan, and Florida currently allow driverless cars⁵⁵. The European Union requires that a driver be in constant control of the vehicle and able to override the autonomous system at any time²³.

The Domain

- Competition from Google, Audi, BMS, Mercedes-Benz, Volvo, GM, and Nissan
- Commercialization and competitive pricing to make the cars affordable and widely adopted
- Reluctance of people to give up driving and fear of technology failure and hacking
- Laws and regulations
- Liability issues

The Organization

The Ford Motor Company manufacturers, distributes, services and finances automobiles across 6 continents and employs roughly 181,000 people. Ford is a Fortune 500 company that has been around for 150 years. Henry Ford was the pioneer of the moving assembly line for mass production of automobiles, which made them affordable to middle-class Americans. In the mid-2000's Ford was in trouble. In 2006, Bill Ford²⁹, great grandson of Henry Ford and an environmentalist, stepped down as CEO and passed the reigns to Alan Mulally, formerly of Boeing, who started focusing more on data-driven decisions³⁸. By 2011, Ford Company started to get back to its roots envisioned by Henry Ford with his vision of freedom of mobility in their Blueprint for Mobility⁸ to globally democratize their technology⁴⁵. Ford's current slogan is "We Go Further at Ford to meet the needs of our customers, the challenges of our industry and the issues confronting our world."

The Stakeholders

The chief stakeholders at Ford⁴⁵ are:

- William Clay Ford, Jr. - Executive Chairman, Chairman of the Board, and environmentalist,
- Alan R. Mulally - President and CEO
- Mark Fields - COO
- Nicholas J. Smither, Group VP and CIO
- Paul A. Mascarenas, VP and CTO, Research & Advanced Engineering
- John Ginder³⁸, Manager of Systems Analytics
- K. Venkatesh Prasad⁴⁰, Group and Senior Technical Leader of Vehicle Design and Infotronics
- Mike Cavaretta project leader for Predictive Analytics
- Robert L. Shanks - EVP and CFO
- John Flemming - EVP Global Manufacturing and Labor Affairs
- James D. Farley, Jr. - EVP, Global Marketing, Sales and Service and Lincoln
- Raj Nair, Group VP, Global Product Development
- David G. Leitch - Group VP and General Counsel
- Ziad S. Ojakli - Group VP Government and Community Relations
- Bennie W. Fowler – Group VP, Quality and New Model Launch
- Stephen E. Blegun – VP International Governmental Affairs
- Hau Thai-Tang – VP of Engineering
- Ford's 181,000 employees

The chief stakeholders outside Ford are:

- Legislators
- Insurance Companies
- Global Citizens who would be affected by traffic congestion and mobility needs

Core Business Problem

- How does Ford build on the research it has already done, combine the existing pieces in a cost-effective manner to help promote acceptance of autonomous vehicles with the consumers, legislators, and insurance companies?

Ford has been using its analytics departments throughout the company to determine what customers want, to manage vehicle complexity, to develop a Smart Inventory Management System (SMIS) for getting the right vehicles with the right features to the customers in the geographic area most likely to buy them, to minimize Ford's environmental impact, and for better product design. They already have a lot of bright people on staff and are constantly hiring more. In 2012, Ford opened its Silicon Valley Lab in Palo Alto in order to work more closely with the local universities, start up companies, and leading innovators such as Facebook, Microsoft, and Google⁴⁵. Ford has been working with the University of Michigan and State Farm to build an automated Ford Fusion Hybrid research vehicle and investigate whether it helps reduce rear-collisions⁵. Ford has also been working with MIT and Stanford to give cars "intuition" to cue off things around them to predict what will happen next³. Ford's cars already can self-park, self-drive in slow moving traffic, and redirect drivers around heavy traffic³.

As Jim McBride, a Ford Research and Innovation technical expert has said, "There is no technology barrier from going where we are now to the autonomous car. There are affordability issues, but the big barrier to overcome is customer acceptance."²⁷

Research Agenda

In order to develop a transition plan, Ford will need to focus its research on costs, relationships with consumers, legal and insurance issues. Ford has already started by getting internal support from its stakeholders and by starting to build the necessary relationships to make autonomous

Since there are not really technological issues to build an autonomous car, Ford should focus on how to combine the existing technologies into a cost-effective package that consumers will be able to afford. Ford already includes the SYNC Voice-Activated Technology and with its SYNC AppLink allowing software developers to link their products to the voice activated controls (OpenXC⁴⁴ working with Android and Python), the Blind Spot Information System (BLIS) with Cross-Traffic Alert, Lane-Keeping System (to prevent lane drift), Adaptive Cruise Control and Forward Collision Warning (a heads-up display), and Active Park Assist built into the Ford Fusion which is outselling Toyota⁴⁷.

- Find price points that help minimize the transition cost using sales data, parts data, economic data, and customer sentiment data. Ford is already tracking availability and demand for rare earth elements such as lithium and platinum¹, so it would be easy to extend their tracking.
- Identify components that could be built by others – for instance try partnering with Google for such things as enhanced heads-up cockpit screens, essentially Google glass windshields to provide users better navigation, entertainment, and information whether the car is driving itself or if a human driver needs to take over.

In a recent global survey of 1,514 consumers 18 years or older, Cisco found that 57% trust driverless cars- even more so in emerging markets such as Brazil, India and China²⁶, so it is clear consumers are eager for self-driving cars and there are markets to be targeted. Assuming the production costs can be contained, Ford would need to focus on encouraging consumer adoption, some of the ways they could do this include:

- Survey customer sentiment as to which aspects could be switched over first – surveys, examine what features customers are searching the website for or are talking about, use Google Trends and Analytics.
- Conduct a competitor analysis to compare what the competition is offering and working on.
- Use the 25 gigabytes of data per hour that the Ford Fusion Energi plug-in hybrid generates to determine how people are using their cars and how the safety features are performing.
- Launch a targeted pro-autonomous car campaign – In 2012, Ford had a \$4 billion advertising budget and a \$5.5 billion research budget. They could easily use their data and part of their budget to highlight safety features, security, convenience, lower mobility costs (cost savings), lower energy, resource and space consumption, and greater personal freedom for those who cannot drive due to age or medical restrictions. Product placement in movies can also target a wide audience.
- Pilot cars in highly populated areas with younger people or Florida retirement communities. Take a tip from Sun and Apple to get the young people attached and familiar with your products early and then when they are the decision makers they will tend to be loyal to your brand.
- Keep abreast of technological developments and track it with a technology analysis to be able to swap out pieces that are more cost-effective.
- Brainstorm new avenues of employment for those affected by less need for auto mechanic shops and automotive parts.
- Marketing and safety could work with DMVs to develop driver training and awareness around autonomous cars.

Ford should not wait until their autonomous car is cost-effective to promote it to legislators, governors, mayors, and other legislative parties, but rather get out in front of the issues to pave the way for easier acceptance. To continue making progress on adoption, Ford's general counsel could:

- Survey existing laws to find precedents to see how other new forms of technology have been implemented and learn from those mistakes.
- Lobby for favorable legislation for autonomous cars – Ford spent \$6 million in lobbying during 2013⁵⁰.
- Work with the federal government, states, cities, and metropolitan areas to offer tax incentives and carpool lane stickers for early adopters of autonomous cars.
- Ford could also use speeches, texts, blogs, and press releases to determine which legislators are most receptive to promoting positive autonomous car legislation.

Ford has already has a relationship with State Farm for investigating if their autonomous research car can reduce rear-collisions, Ford could go even further to tackle the liability issues. Currently there are fears of potential liability for the manufacturer and the maintenance/repair business if an accident could be traced to a design or maintenance failure⁵⁷. Perhaps by partnering with insurers or getting support from Warren Buffet (GEICO is a wholly owned subsidiary of Berkshire Hathaway) for a join-venture to develop new insurance pricing models for autonomous car insurance. Not having enough experience with insurance models, I would need to leave this research to a future paper to determine what specific data could be collected and analyzed effectively.

Way Forward

Autonomous cars are the way of the future. With growing populations living in cities, an estimate of 4 billion cars on the roads⁸, an increasing traffic congestion problem (estimated to cost \$121 billion in the US⁵⁹) and roughly 30,000 traffic fatalities (AAA estimates costs 3 times more than traffic congestion – roughly \$300 billion; every traffic injuries averages \$126,000⁶⁸), society needs to change its way of thinking about transportation. There is no doubt that Ford can be a competitor in the autonomous car arena. There may be some bumps in the road, but Ford is well positioned to take advantage of its global network of employees, its data-driven leadership, its relationships with technology innovators, its experience mass-producing parts and making them interchangeable and customizable, and its models of inventory customer preferences and inventory management to promote its autonomous car.

Ford has shown interest in developing new technologies starting with the low-end car models enabling them to take advantage of economies of scale as well as reach a broader customer base. Ford has also laid the groundwork for relationships and developing models for inventory, sustainability, customer preferences, so it should not be difficult to extend their models to handle new technology ideas. Ford also has the flexibility to switch products and components⁷¹ as well as the capital to invest in other companies to reach their goals⁷⁰. Ford has also been able to admit mistakes and adapt to what their customers desire⁷².

Supporting Research

- 1) Ford Embracing Analytics and Big Data to Inform Eco-Conscious Decisions, Stay Green
<http://corporate.ford.com/news-center/press-releases-detail/ford-embracing-analytics-and-big-data-to-inform-eco-conscious>
- 2) Self-driving Ford could see around the truck ahead of you, thanks to MIT and Stanford
<http://www.extremetech.com/extreme/175205-self-driving-ford-could-see-around-the-truck-ahead-of-you-thanks-to-mit-and-stanford>
- 3) Ford, Stanford and MIT research giving self-driving cars 'intuition'
<http://www.latimes.com/business/autos/la-fi-hy-ford-mit-stanford-autonomous-vehicle-20140122,0,7039751.story#axzz2ukAbszMA>
- 4) Ford's Self-Driving Car Produces 3D Road Map
<http://news.sky.com/story/1216261/fords-self-driving-car-produces-3d-road-map>
- 5) Ford unveils self-driving research car
<http://www.theverge.com/2013/12/12/5204256/ford-unveils-automated-fusion-hybrid-research-vehicle>
- 6) Ford predicts self-driving, traffic-reducing cars by 2017
<http://www.extremetech.com/extreme/132147-ford-self-driving-cars-2017>
- 7) Ford self-driving car parks and swerves around pedestrians
<http://www.slashgear.com/ford-self-driving-car-parks-and-swerves-around-pedestrians-08300666/>
- 8) For Blueprint for Mobility
<http://corporate.ford.com/annual-report-2012/better-world-blueprint-for-mobility.html>
<http://corporate.ford.com/microsites/sustainability-report-2011-12/financial-mobility-blueprint>
- 9) Self-Driving Cars: Inside the Road Revolution
<http://www.fastcompany.com/3022489/innovation-agents/self-driving-cars-let-go-of-the-wheel>
- 10) Autonomous Driving Companies to Watch
<http://www.fastcompany.com/3024362/innovation-agents/10-autonomous-driving-companies-to-watch>

QNX – mobile, secure, reliable embedded systems; Acura HandsFreeLink, Audi Multi Media Interface, BMW infotainment system, Chrysler UConnect, core of Cisco's Modular IOS and IOS-XR software, GM OnStar, Hyundai Mobis MTS-1 navigation system, Landrover digital instrument cluster, Porsche Communication Management system, Saab infotainment system.

Delphi – 360 degree sensing, radar & vision fusion technology, cross traffic alert, collision avoidance, comprehensive connectivity; voice recognition systems, workload manager software, driver state sensor technology, high resolution, reconfigurable displays

Cicso – investing with NXP in Cohda which is building the hardware and software that will allow vehicle on the road to form intelligent ad hoc mesh networks

Continental Automotive Group – Traffic Jam Assistant, Parking Assistant, Parking Pilot, Highway Chauffeur Highway Pilot

Covisint – supply chain for consumers, suppliers, dealers and business partners; Owner and Vehicle Engagement, Supply Chain Engagement, Dealer Engagement

Codha Wireless – V2X device for connected vehicles; allows cars to communicate wirelessly with each other and with traffic infrastructure – location, speed, direction, 360 degree driver awareness

Autotalks – enables Vehicle-to-Vehicle (V2V) and Vehicle-to-Infrastructure (V2I) communication with its V2X chipset

Mobileye – vision algorithms, collision avoidance technology; already used by BMW, GM, Volvo, and Ford

Nvidia – infotainment, navigation, digital instrument clusters, advanced driver assistance systems (enhanced night vision, pedestrian detection, speed limit sign recognition), photo-realistic digital cockpits to life. Used by Lamborghini, Rolls Royce, Peugeot, BMW, Audi, Tesla, and Porsche.

11) Brynjolfsson Says Self-Driving Cars Developing Faster Than Expected

<http://blogs.wsj.com/cio/2014/02/28/brynjolfsson-says-self-driving-cars-developing-faster-than-expected/>

12) Everyone Will Have Self-Driving Car by 2026, Analyst Says

http://www.huffingtonpost.com/2014/02/27/morgan-stanley-autonomous-cars-prediction_n_4867613.html

13) The Office of the Future Is a Self-Driving Car

<http://www.fastcompany.com/3026516/fast-feed/the-office-of-the-future-is-a-self-driving-car>

14) Just how close to commercial reality is a self-driving car?

<http://features.blogs.fortune.cnn.com/2014/01/10/self-driving-car-google/>

15) Exclusive: Google Designing Its Own Self-Driving Car, Considers 'Robo Taxi'

<http://jessicalessin.com/2013/08/23/exclusive-google-designing-its-own-self-driving-car-considers-robo-taxi-2/>

16) Auto Correct: Has the self-driving car at last arrived?

http://www.newyorker.com/reporting/2013/11/25/131125fa_fact_bilger?currentPage=all

17) Google: Self-driving cars in 3-5 years. Feds: Not so fast

<http://www.extremetech.com/extreme/147940-google-self-driving-cars-in-3-5-years-feds-not-so-fast>

18) Self-driving cars right around the corner thanks to Google partnership

<http://www.extremetech.com/extreme/164674-self-driving-cars-right-around-the-corner-thanks-to-google-partnership>

19) Data Shows Google's Robot Cars Are Smoother, Safer Drivers Than You or I

<http://www.technologyreview.com/news/520746/data-shows-googles-robot-cars-are-smoother-safer-drivers-than-you-or-i/>

20) Tesla Motors will put a self-driving car on the road within three years

<http://www.extremetech.com/extreme/166826-tesla-motors-will-put-a-self-driving-car-on-the-road-within-three-years>

21) Self-Driving cars will hit the streets by 2020 says Nissan at CEATEC

<http://www.extremetech.com/extreme/167897-for-sure-self-driving-cars-by-2020>

22) Frankfurt Auto Show: Mercedes shows off fully autonomous S-Class, production cars coming by 2020

<http://www.extremetech.com/extreme/166598-frankfurt-auto-show-mercedes-shows-off-fully-autonomous-s-class-production-cars-coming-by-2020>

- 23) Mercedes-Benz reveals recent test of self-driving car
<http://www.latimes.com/business/autos/la-fi-hy-autos-mercedes-autonomous-car-20130909,0,5195752.story#axzz2ukAbszmA>
- 24) It really is hands free! Self-driving Mercedes-Benz is unveiled – and it should be available within seven years
<http://www.dailymail.co.uk/sciencetech/article-2418526/Self-driving-Mercedes-Benz-sale-2020-unveiled.html>
- 25) Take that, Google: Oxford University sees self-driving as a \$150 option in future cars
<http://www.extremetech.com/extreme/149045-take-that-google-oxford-university-sees-self-driving-as-a-150-option-in-future-cars>
- 26) Cisco survey: Consumers are getting comfortable with the idea of the driverless car
<http://gigaom.com/2013/05/14/cisco-survey-drivers-are-getting-comfortable-with-the-idea-of-the-driverless-car/>
- 27) Ford is ready for the autonomous car. Are drivers?
<http://gigaom.com/2012/04/09/ford-is-ready-for-the-autonomous-car-are-drivers/>
- 28) The Gigaom interview: Bill Ford on the new golden age of automotive innovation
<http://gigaom.com/2013/12/09/the-gigaom-interview-bill-ford-on-the-new-golden-age-of-automotive-innovation/>
- 29) Bill Ford: A future beyond traffic gridlock
http://www.ted.com/talks/bill_ford_a_future_beyond_traffic_gridlock.html
- 30) Cisco, NXP invest in autonomous-car startup Cohda
<http://gigaom.com/2013/01/04/cisco-nxp-invest-in-autonomous-car-startup-cohda/>
- 31) If cars could talk to one another, what could (and should) they say?
<http://gigaom.com/2012/02/28/if-cars-could-talk-to-another-what-could-and-should-they-say/>
- 32) Nissan Autonomous Cars: We talk Self-Driving with R&D chief Carla Bailo
<http://www.slashgear.com/nissan-autonomous-cars-we-talk-self-driving-with-rd-chief-carla-bailo-22294639/>
- 33) Google's Plan for Autonomous Cars Doesn't Go Far Enough
<http://www.wired.com/opinion/2013/09/we-need-to-think-about-the-infrastructure-for-autonomous-cars-too/>
- 34) Why Google Will Lose in Driverless Cars (and Who Will Win)
<http://www.forbes.com/sites/haydnshaughnessy/2013/02/04/why-google-will-lose-in-driverless-cars-and-who-will-win/>

35) Autonomous car
http://en.wikipedia.org/wiki/Autonomous_car

BMW 5 Series	Mercedes S 500	Nissan Leaf EV	Google Prius and Lexus	General Motors Cadillac SRX
Video camera tracks lane markings and reads road signs	Stereo camera sees objects ahead in 3-D	Front and side radar	LIDAR on the roof detects objects around the car in 3-D	Several laser sensors
Radar sensors detect objects ahead	Additional cameras read road signs and detect traffic lights	Camera	Camera helps detect objects	Radar
Very accurate map	Short- and long-range radar	Four wide-angle cameras show the driver the car's surroundings	Very accurate map	Very accurate map
Ultrasonic sensors	Ultrasonic sensors		Inertial measuring unit tracks position	
Differential GPS	Infrared camera		Wheel encoder tracks movement	
Side laser scanners			Front and side radar	

36) Preparing a Nation for Autonomous Vehicles: Opportunities, Barriers and Policy Recommendations
<http://www.enotrans.org/wp-content/uploads/wpsc/downloadables/AV-paper.pdf>

37) How analytics helped Ford turn its fortunes
http://www.computerworld.com/s/article/9244363/How_analytics_helped_Ford_turn_its_fortunes?taxonomyId=18&pageNumber=2

38) Ford's Big Data chief sees massive possibilities, but the tools need work
<http://www.zdnet.com/fords-big-data-chief-sees-massive-possibilities-but-the-tools-need-work-700000322/>

39) How Ford reimagined IT from the inside out to power its turnaround
<http://www.techrepublic.com/blog/tech-sanity-check/how-ford-reimagined-it-from-the-inside-out-to-power-its-turnaround/10671/>

40) Ford's 'open platform' car: How open is 'open'?
<http://www.zdnet.com/fords-open-platform-car-how-open-is-open-700000745/>

41) Ford is now a 'personal mobility' company: How the comeback kids are riding tech to a new destiny
http://news.cnet.com/8301-11386_3-57472376-76/ford-is-now-a-personal-mobility-company-how-the-comeback-kids-are-riding-tech-to-a-new-destiny/

42) In-Car Location-Based Services: Companies Are Taking Steps to Protect Privacy, but Some Risks May Not Be Clear to Consumers
<http://www.gao.gov/assets/660/659509.pdf>

43) Ford Exploring Big Data, Open Source Tech with New Silicon Valley Lab
<http://slashdot.org/topic/bi/ford-exploring-big-data-open-source-tech-with-new-silicon-valley-lab/>

44) The OpenXC Platform
<http://openxcplatform.com/>

45) Ford 2012 Annual Report
<http://corporate.ford.com/doc/ar2012-2012%20Annual%20Report.pdf>

46) Ford Speeds Along the Big-Data Highway
http://www.allanalytics.com/author.asp?section_id=1411&doc_id=262011

47) Ford Motor Co. (F) Beats Toyota™ As 2013 Best-Selling Auto Brand In The US As Fusion Sedan, Fiesta Mini, Escape Crossover Broke Records
<http://www.ibtimes.com/ford-motor-co-f-beats-toyota-tm-2013-best-selling-auto-brand-us-fusion-sedan-fiesta-mini-escape>

48) What Motivates Someone to Buy a Plug-In Electric Car? Poll Shows Differences Among Nissan Leaf, Toyota Prius, Chevy Volt Owners
<http://www.ibtimes.com/what-motivates-someone-buy-plug-electric-car-poll-shows-differences-among-nissan-leaf-toyota-prius>

49) Ford Fusion Marks Best February Sales Ever; San Francisco and Los Angeles Sales More Than Double
<http://corporate.ford.com/news-center/press-releases-detail/pr-ford-fusion-marks-best-february-37782>

- Ford Fusion is achieving the fastest turn rates and the strongest sales momentum in California – the nation's largest passenger car market
- Fusion Hybrid retail sales up 556 percent in Los Angeles, Fusion's largest hybrid market in the U.S.
- Total Fusion sales nationwide up 28 percent last month compared to February 2012
- Fusion sales increase in all regions of the country – L.A., up 115 percent; San Francisco, 102 percent; Atlanta, 51 percent; Houston, 73 percent; Miami, 114 percent and Orlando, 72 percent

50) Ford Motor Co – Influence & Lobbying

<https://www.opensecrets.org/lobby/clientsum.php?id=D000000182>

Ford spent \$6,120,000 in total lobbying expenses during 2013
H.R. 1027 Advanced Vehicle Technology Act of 2013
S.488 Advanced Vehicle Technology Act of 2013

51) Ford Partners With Bug Labs to Develop Open Source Platform for In-Car Innovatin'
<http://techcrunch.com/2011/09/12/ford-partners-with-bug-labs-to-develop-open-source-platform-for-in-car-innovatin/>

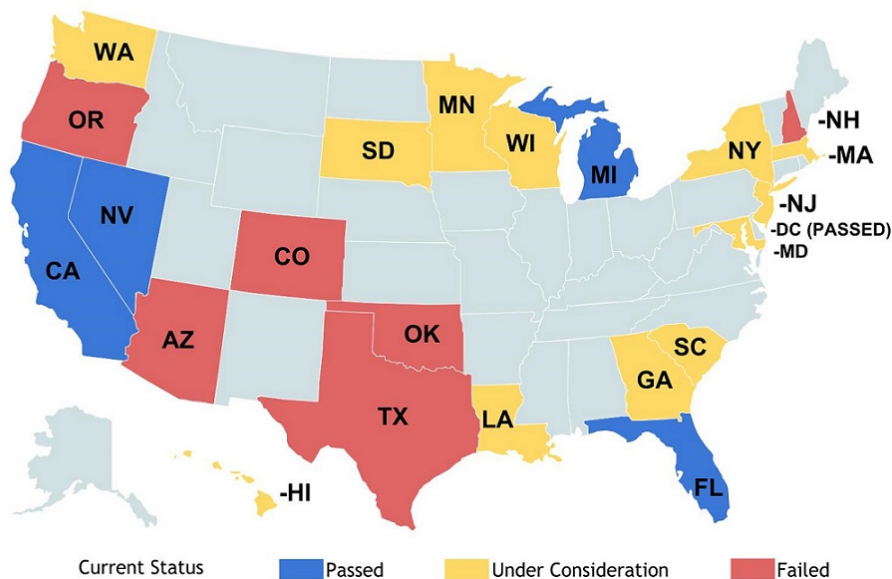
52) Specification for the OpenXC JSON message format
<https://github.com/openxc/openxc-message-format>

19 signal names in the specification – steering_wheel_angle, torque_at_transmission, engine_speed, accelerator_pedal_position, parking_brake_status, transmission_gear_position, gear_lever_position, odometer, ignition_status, fuel_level, fuel_consumed_since_restart, door_status, headlamp_status, high_beam_status, windshield_wiper_status, latitude, longitude

53) An in Depth Analysis of Autonomous Cars
<http://www.autonomouscars.com/>

54) How an Autonomous Car Gets Around
<http://www.nytimes.com/interactive/2012/10/28/automobiles/how-an-autonomous-car-gets-around.html?ref=automobiles>

55) Automated Driving: Legislative and Regulatory Action
https://cyberlaw.stanford.edu/wiki/index.php/Automated_Driving:_Legislative_and_Regulatory_Action



56) National Highway Traffic Safety Administration's Automated Vehicles Policy
http://www.nhtsa.gov/staticfiles/rulemaking/pdf/Automated_Vehicles_Policy.pdf

57) The 12 Most Important Questions About Self-Driving Cars
<http://www.popularmechanics.com/cars/news/industry/the-12-most-important-questions-about-self-driving-cars-16016418>

58) Toyota's Semi-Autonomous Cars Hit the Highway

<http://www.popularmechanics.com/cars/news/industry/toyotas-semi-autonomous-cars-hit-the-real-road-16024804>

59) The American Commuter Spends 38 Hours a Year Stuck in Traffic... and it's even worse in big cities. In D.C., Los Angeles, and San Francisco, the typical car commuter spends more than 60 hours – more than a week of work-time—sitting in his car, stuck.

<http://www.theatlantic.com/business/archive/2013/02/the-american-commuter-spends-38-hours-a-year-stuck-in-traffic/272905/>

60) U.S. car accident cost: \$164.2 billion: AAA report says crashes are 2 ½ times more costly than traffic jams

http://money.cnn.com/2008/03/05/news/economy/AAA_study/

61) Crash avoidance features reduce crashes, insurance claims study shows; autonomous braking and adaptive headlights yield biggest benefits

<http://www.iihs.org/iihs/news/desktopnews/crash-avoidance-features-reduce-crashes-insurance-claims-study-shows-autonomous-braking-and-adaptive-headlights-yield-biggest-benefits>

62) They're working: Insurance claims data show which new technologies are preventing crashes

<http://www.iihs.org/iihs/sr/statusreport/article/47/5/1>

For example, with Mercedes' basic forward collision warning system, the frequency of collision claims inched down 3 %, but severity shot up by \$813. That's probably because the pricey radar sensors used by the system are mounted right behind the grille and thus are vulnerable to damage in a crash.

63) The Coming Robot Invasion: Google's Self-Driving Cars Will Destroy Car Insurance Companies

<http://www.carinsurancecomparison.com/the-coming-robot-invasion-googles-self-driving-cars-will-destroy-car-insurance-companies/>

64) Continental to partner with IBM on autonomous driving systems

<http://europe.autonews.com/article/20130911/ANE/309119985/continental-to-partner-with-ibm-on-autonomous-driving-systems>

Continental CEO Elmar Degenhart said at the Frankfurt auto show on Tuesday that IBM has the requisite expertise to handle large data volumes needed to link cars to each other.

65) Google, IBM, & Continental AG Teaming up on Self Driving Vehicles?

<http://www.fool.com/investing/general/2013/08/26/google-ibm-germanys-continental-ag-teaming-on-self.aspx>

Google – bought patents from IBM in 2011 and 2012, some of which were related to auto safety and self-driving vehicle technology

66) Google vs. Tesla vs. Ford: Who Has the Best Self-Driving Car to Get You Home Safely?

<http://www.fool.com/investing/general/2013/12/22/google-vs-tesla-vs-ford-who-has-the-best-self-driv.aspx>

Berkshire Hathaway owns stock in GM, IBM and owns Geico as well as many other insurance firms.

67) Dispatch From the Future: Uber to Purchase Driverless Cars from Google

<http://techcrunch.com/2013/08/25/uberauto/>

Google is invested in Uber. Uber to purchase 2,500 driverless cars, approx.. \$375 million for a fleet of Google's GX3200 vehicles.

68) Self-Driving Cars: A Crash Course In Communication

<http://www.fastcompany.com/3024360/tech-forecast/driverless-cars-a-crash-course-in-communication>

69) Ford Gets Diplomatic About Apple's CarPlay and Microsoft Ties

<http://techcrunch.com/2014/03/03/ford-gets-diplomatic-about-apples-carplay-and-its-microsoft-ties/>

70) Ford buys Livio for single in-car infotainment and app standard push

<http://techcrunch.com/2014/03/03/ford-gets-diplomatic-about-apples-carplay-and-its-microsoft-ties/>

71) Ford 'not married' to Microsoft for next-gen Sync, but BlackBerry isn't necessarily in

http://news.cnet.com/8301-32969_3-57619624-300/ford-not-married-to-microsoft-for-next-gen-sync-but-blackberry-isnt-necessarily-in/

Ford managing director Pin van der Jagt said that Ford is always questioning and evaluating suppliers and that re-evaluating the Microsoft deal is just a part of normal business. "Sync 1 and 2 was done with Microsoft but we are not married with them. For us, it's a supplier, so every time we keep evaluating is it the right partner."

72) Ford admits touchscreen defeat, put the buttons and knobs back into Ford Sync

<http://www.extremetech.com/extreme/176936-ford-admits-touchscreen-defeat-puts-the-buttons-and-knobs-back-into-ford-sync>

73) Ford Gives a Demo of Its Model T of Driverless Cars: A Ford prototype and a Volvo user study show how carefully automated driving will be commercialized

<http://www.technologyreview.com/view/522636/ford-gives-a-demo-of-its-model-t-of-driverless-cars/>

Ford already includes cameras, radar, ultrasound sensors, and automated driving features including lane tracking, adaptive cruise control, and self-parking in the Fusion, a car that starts at just under \$30,000 with the technology.