



Who's steering? How technology is reshaping the automotive industry

In 1982, Buckminster Fuller, a renowned 20th century inventor and futurist, created the “Knowledge Doubling Curve,” a model that describes the rate at which human knowledge is doubling. According to Fuller and his model, until 1900 human knowledge was doubling approximately every century, and by 1945 the rate was every 25 years. Once we started encoding our knowledge digitally, the rate of data accumulation grew exponentially.

Today, with advances in 5G connectivity, the Internet of Things, artificial intelligence and machine learning, the rate at which human knowledge is doubling is advancing to a matter of hours. This dramatic acceleration of knowledge accumulation is affecting everything we do and manufacture, including the passenger vehicle, particularly given the rate of automotive production and its significance to the global economy. What do automotive industry executives think is going to happen and where will change lead us? KPMG’s annual Global Automotive Executive Survey (GAES) is a window into this rapid pace of change. Now in its 19th consecutive year, the survey provides deep insight into the future of the automobile, its immediate environment and the broader technological and social trends that impact the industry as a whole, both in Canada and globally. The men and women who plan production for millions of cars annually must be keenly aware of shifts in customer demands, consumer trends and technology in order to maintain, or increase, their market share. The consequences of falling behind are severe.

If there is one word that captures the key theme of this year’s GAES report it is “disruption.” The automotive industry continues to evolve through innovation and transformational change as industry players are adapting to shifting preferences on car ownership and new technological developments such as Autonomous Vehicles (AVs) and alternative drivetrains. These changes will have the biggest impact on how we drive cars and how they are built.

Declining car ownership

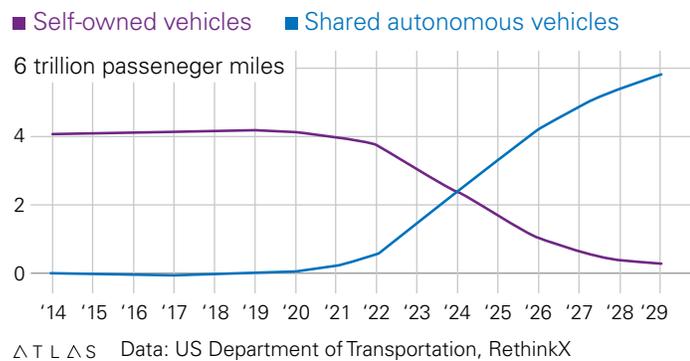
Original equipment manufacturers (OEMs) are redefining their future role in a fast-changing environment. Car sharing is still in its infancy, but nearly half (44 percent) of executives surveyed in the GAES believe that the OEMs could be big winners in the battle for the direct customer relationships, and over one-third of global consumers agree. As technology advances, over 80 percent of automotive executives strongly agree that the real viable option for the physical retail outlet is expansion into service factories and used car hubs. The pressure is on, however, as more than half of executives are highly confident that the number of physical retail outlets will be reduced by 30 percent to 50 percent by 2025. As a result, OEMs may not be as reliant on B2C relationships as different providers may become more prominent in making cars available for consumer use.

KPMG’s GAES shows a year-over-year trend of declining faith in car ownership amongst executives and consumers. This trend is evident across North America as the rate of car ownership per household and the percentage of young people with a driver’s license is declining. However, those survey findings and consumer sentiment are at odds with industry statistics. According to DesRosiers Automotive Consultants Inc., 2017 was a banner year for automotive sales in Canada, with sales of light vehicles up 5 percent last year, exceeding 2 million units for the first time in history, and the U.S. auto market also posted a strong year. Some of the momentum in sales can be attributed to a resurgence since the 2009

recession, but the continued move towards Crossovers, SUV's and pickup trucks are a clear signal that North America is still using passenger vehicles to move people and products. Regardless, the trends point to a potential different ownership model for cars in the future.

Bob Lutz, former vice chairman of GM, predicts a dire future for the industry and the "end of the automotive era." Mr. Lutz believes daily travel will migrate to standardized, shared passenger modules as the transformation of the traditional auto industry accelerates. He envisages a future where humans adapt to sharing cars with strangers as self-driving cars dominate transportation. In its *Rethinking Transportation 2020-2030* report, RethinkX, a San Francisco-based think tank, expects that by 2030 most road travel will be via shared vehicles. The good news is cars will still be on the road; but the companies that manufacture them may become less relevant if cars become a transportation commodity.

"Transportation-as-a service" are projected to replace cars in the US



Autonomy or safety—or both?

KPMG's GAES also revealed that the large majority of executives (94 percent) believe that effective driving policy and regulations for autonomous driving will be established by 2040, at the latest. The main catalyst for autonomous driving is safety. Active cruise and steering control, lane departure warning systems and automated braking are all designed to avoid collisions. While the by-product of this technology is a self-driving car, the real and immediate impact is fewer accidents. Collision avoidance will greatly impact and reduce insurance rates, the number of repair facilities and the frequency of replacement rentals. The U.S. Department of Transportation's *National Motor Vehicle Crash Causation Survey* and its 2008 report to Congress concluded that 93 percent of collisions were caused by human error. Current crash statistics follow the same trend.

“Does this mean that the pleasure of driving a car as we know it – the ability to steer, brake and control a vehicle – will be the responsibility of sophisticated programming and radar? Will manual driving someday become illegal? It could.”

But what remains clear is that autonomous driving is a new battlefield for the auto industry that will directly affect consumer demand and have a material and permanent impact on the role of OEMs in the car sharing economy and their future profitability.

Over time human drivers will likely be seen as dangerous and the ability to drive cars manually may be restricted. Of the executives surveyed in the GAES, 74 percent believe that mixing autonomous and non-autonomous traffic will lead to severe safety issues. Fully autonomous vehicles and human drivers are unlikely to use the same roads and will require new infrastructure concepts and a unique regulatory environment. If we want autonomous driving to develop quickly, regulators will need to adopt a step-by-step approach and start very soon by separating areas to avoid mixed traffic of vehicles equipped with different levels of autonomous technology.

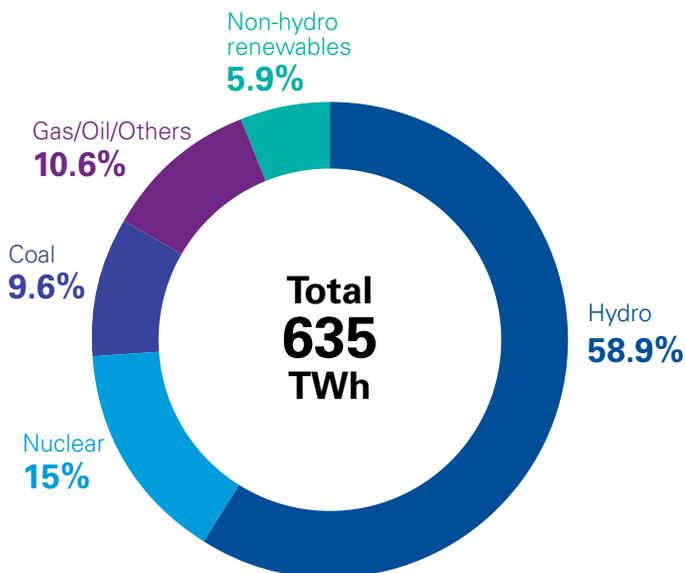
The development of "secured spaces" for an interim period might be a solution to disconnect AVs from the complexity of today's transportation ecosystem. Establishing exclusive, separated car lanes for AVs could, however, limit the range of unusual eventualities that would be otherwise be experienced in mixed traffic. This would make it nearly impossible to include the range of eventualities into an algorithm's training data, which would be required for future integration of AVs and manually driven vehicles. But, if the segregated approach were successful, it may not be necessary to train autonomous vehicles to handle mixed transit. If it works for trains why shouldn't it work for cars?

Future of combustion and electric readiness

Automotive executives are highly convinced that internal combustion engines (ICEs) will remain important. One of the biggest issues facing the adoption of electric vehicles (EVs) is where the electricity comes from. Some countries, such as the U.S., still rely heavily on coal and other fossil fuels to power their electricity grid. In Canada, the majority

(59 percent) of Canada’s electricity generation is derived from hydropower, while the balance of the mix is split between nuclear, oil and gas, coal and non-hydro renewables.

Generation by source, 2015



Source: Natural Resources Canada, “Electricity Facts”, www.nrcan.gc.ca/energy/facts/electricity/20068

A gradual shift to e-mobility is generally intended to reduce carbon emissions and mitigate environmental impact. While hydropower is a relatively emissions-free energy source, increasing output of hydropower or burning more fossil fuels to power EVs would reduce the expected environmental benefits of e-mobility.

Global automotive executives believe there will be a balancing mix of alternative drivetrain technologies

and ICEs. E-mobility is dominating executives’ key trend agenda, but its roll-out is progressing slowly. In addition to the problems associated with electricity generation, a successful infrastructure set-up seems to be the true showstopper for e-mobility. For now, it takes too much time for the average consumer to charge an EV, and the options are limited. More than half (54 percent) of executives surveyed still believe that pure battery EVs will fail due to the challenge of setting up the required infrastructure. Executives have become more optimistic as compared to last year, but the obstacles remain high and most consider fuel cell EVs as the real breakthrough. However, costs are the biggest obstacle as fuel cell cars require an entirely new hydrogen infrastructure of reforming plants, pipelines and filling stations. Despite the challenges, the advantage of fuel cell vehicles is that they can be “filled up” in a matter of minutes versus several hours for plug-in EVs.

The end of our love affair with cars?

Assuming Fuller’s knowledge curve speeds up dramatically due to new technological developments, many of the headwinds we face in alternate fuels and autonomous driving will eventually be overcome. But the lust for freedom and sense of adventure that comes with owning a car will persist. Last year a LaFerrari Aperta supercar sold for a record \$10 million at an event in Italy marking the 70th anniversary of Ferrari, the most money ever fetched by a 21st century vehicle. The futuristic Aperta, which had yet to be assembled and was presented as a digital mock up, sold for twice the amount auctioneers expected after a bidding war between at least 12 auction attendees. For some, the love affair with the automobile still burns brightly.

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