World Car Trends 2015
“Connected Mobility and Digital Lifestyle”

New York, April 2015
Global Expert Community

75 World Car Jurors

Global Media Trends

Top 25 markets
All automotive brands (> 150) and models
Top opinion leading media (TV | print | online)
2014 – 2015: > 100 million documents (blogs, forums, networks)

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Management Summary

This year, there is one overarching theme: “Connected Mobility and Digital Lifestyle”

Connected Mobility

The current hype of connected mobility is mainly driven by three topics:

- **Autonomous driving** – which is gaining acceptance and expected within the next 4 years
- **Smartphone integration** – the integration of Android (Google) and Apple
- **New displays and visuals** – to cope with all those new features

The new digital and electric car will offer totally new perspectives of the future design of the car. The car will become a stylish retreat while travelling. Multimedia displays will stimulate new interior designs – making the connected car a digital lifestyle statement.

New Challenges

Future technologies are paving the way for new players as well as new business models in the automotive sector. One question excites the industry and our global experts: the future role of the tech companies – especially of Apple and Google. A large majority, 68% of our jurors, expect that tech companies will become a major challenge for the established car industry within the next 10 years. And 38% expect this to happen within the next 5 years. Whether the tech companies will succeed with their own cars – this is an open question, according to our experts. But a slight majority of more than 50% expect that they will not only be ambitious, but also successful. Do they have a realistic chance? Yes, since a modern high-tech car already includes a bigger software package than anything else – including software products like Facebook or Microsoft Office. However, it’s questionable if the low-margin car business is attractive to tech companies or if it’s more about transferring their mobile market domination into the car sector.

Autonomous Driving

The exposure of autonomous driving substantially increased over the last five years through special events, concept and serial production cars. The steep learning curve over the last three years also changed journalists’ perceptions – the once most hated advanced driver assistance feature “Autonomous Driving” has turned into one of the most admired features in 2015. In just three years, what a turn-around. Our experts predict that by 2020, full autonomous driving will find its way to the full-size and luxury segments, while subcompact cars as well as leisure-orientated cars (sports cars & convertibles) will offer a lesser degree of autonomy.

Infotainment System

In-car electronics and connectivity became increasingly more visible in Global media over the last 5 years. The most important infotainment feature – smartphone integration – means an integration of Apple and Google due to their domination of the smartphone OS market. Apple and Google have a smartphone market share of more than 93% - and that was in 2013. The number will be even higher for the last year. Infotainment systems of the OEM’s are still benchmark. However, Apple and Google with their infotainment offerings are very close and much better evaluated than the worst 5 infotainment systems of OEM’s.

Smart Efficiency

Smart efficiency / e-mobility is the unprecedented top trend of recent years. While the oil price is expected to return to the 2010-2014 average price of 100 USD per barrel no sooner than 2020, the current low oil price leads to slower progression in the development of alternative fuels.

Fuel cell electric vehicles gain the most momentum in 2015, while all other electric powertrain options remain stable. However, for the first time, pure battery electric vehicles are seen as the least promising powertrain option.

FCEV

Fuel-cell technology ramps-up for a second time in 2014/15 and becomes highly visible in global media. Toyota clearly dominates FCEV coverage in 2014/2015 YTD with the Mirai and generates 70% share of voice. But Hyundai and Honda also demonstrate significant effort with their fuel-cell technology and generate fair visibility.

FCEVs receive slightly less criticism than BEVs in global media over the last year. Fuel-Cell technology has the chance for a comeback as the next generation EV. However, Hydrogen infrastructure is the biggest challenge for FCEVs.

FCEVs receive a lot of praise from the experts: “They’re impressive for their ease of driving, quietness, range and speed of refuelling.”

BEV

After the slowdown in 2012/2013, BEVs are now seeing a substantial increase in media visibility, pushed by a variety of new battery electric vehicle models. Out of a significant number of BEV models in 2014-2015 YTD, the Tesla Model S and BMW i3 combined account for more than 2/3 of all coverage. Almost every third battery electric vehicle story is about either one of them.

The EV market in Norway grew by 130% in 2014 compared to the previous year driven by attractive governmental incentives like no purchase tax, no VAT, no tolls, free and extra parking areas for EVs, proper EV infrastructure and a clean Norwegian energy production. China is gaining more and more momentum with its ambitious e-car plans (5m e-cars on the road by 2020) and its heavy infrastructure investments, while Germany and USA show limited e-mobility momentum. The key to the roll-out and success of BEVs are advanced battery technology and increased range. Tesla & BMW continue their outstanding EV reputation in 2015 with Model S and i3.

Lightweight

Lightweight coverage on rests at a somewhat consistently low level over the past few years, however weight is increasingly criticised within the media. It is highly agreed that suppliers are contributing significantly in developing lightweight technologies. There is a trend towards an even closer cooperation between OEMs and their supplier in order to achieve innovative solutions.
“Connected Mobility and Digital Lifestyle”

The current ‘top trend cluster’ is driven by smart efficiency / e-mobility, design and connected mobility.

Top 3 Trends 2015

1. Smart Efficiency / E-Mobility
   - Efficiency in General
   - Lightweight Materials
   - New Energy Cars

2. Design

3. Connected Mobility

Quality

Safety

Budget Cars

Shared Mobility

“What will be the most important trends in the automotive industry in 2015?”
Content

1. Connected Mobility
   - New Challenges
     - Autonomous Driving
     - Infotainment System

2. Smart Efficiency
   - FCEV
   - BEV
   - Lightweight
Future technologies are paving the way for new players

... as well as new business models in the automotive sector. The current hype surrounding connected mobility is mainly driven by three topics: Autonomous driving, smartphone & internet integration and new controls & displays.

Connected mobility is mainly driven by three topics:

- Autonomous Driving
- Smartphone & Internet Integration
- New Controls & Displays

Additional competitors

New business models

Future Technologies

Connected Mobility

E-Mobility

Shared Mobility

Google

Apple

Tesla Motors

Uber

Moovel
### Connected mobility remains a top trend in 2015

Connected mobility has always been within the top 3 trends for the last four years, peaking in 2013 as #1.

<table>
<thead>
<tr>
<th>Year</th>
<th>Smart Efficiency / E-Mobility</th>
<th>Connected Mobility</th>
<th>Design</th>
<th>Budget Cars</th>
<th>Safety</th>
<th>Quality</th>
<th>Safety</th>
<th>Budget Cars</th>
<th>Shared Mobility</th>
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<tbody>
<tr>
<td>2012</td>
<td><img src="image1" alt="Graph" /></td>
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<td>2013</td>
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<td>2014</td>
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<td>2015</td>
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<td><img src="image35" alt="Graph" /></td>
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</table>

### What are the most important trends in the automotive industry in 2012 / 2013 / 2014 / 2015?

“Connected mobility remains a top trend in 2015.”
The “digital” car | > 100 million lines of code

Cars are no longer only hardware, they are also software products. Cars already have more lines of code than aircraft and operating systems like Windows 8 or Apple Tiger.
The digital perspective

While the car and tech industry have moved closer together than ever, it’s questionable whether the low-margin car business is attracting the tech companies or if it’s more about transferring their mobile market domination into the car sector.

The undisputed formula: Car data = big data = big interest

The high-likely equation: Design and lifestyle, as well as smart battery technology, are the core competency areas of Apple and Google.

The question-mark: Is the car industry an attractive business model for Silicon Valley?
OEMs are seen as key drivers for the “digital car”

Google and Apple are clearly seen as the key tech companies for the “digital car”. Microsoft and other tech companies are seen as more conservative.

“[…], with its hopeless voice command system, small screens and convoluted programming if you can’t get the voice commands to work.”

Which companies will be the key drivers for the ‘digital car’?
Tech companies will become a challenge for established car manufacturers

Only 19% of the experts believe that tech companies will never become a threat to the established car manufacturers with their own vehicles.

“Within the next 5 years”
38%

“Within the next 10 years”
68%

“15 years or longer”
16%

“Never”
19%
Split opinion: Will tech companies succeed with their own cars?

At this point in time, it is unclear whether Google and Apple will succeed in the car sector with their own vehicles. Amazon is seen in the most critical light and is viewed as very likely to fail.

In your opinion, will Apple, Google, Amazon or any other tech company succeed with their own vehicles in the car sector?
### Three major challenges for tech companies entering the car biz

<table>
<thead>
<tr>
<th>Manufacturing and engineering</th>
<th>Sales and marketing</th>
<th>Financial attractiveness</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Safety</td>
<td>2. Sales and distribution network</td>
<td>1. Slim profit margin (compared with technology sector)</td>
</tr>
<tr>
<td>2. Quality</td>
<td>3. Maintenance / service infrastructure</td>
<td>2. Economies of scale</td>
</tr>
<tr>
<td>3. No manufacturing history</td>
<td>4. Image</td>
<td></td>
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<tr>
<td>4. Perfection in mechanical terms</td>
<td>5. No experience, not much knowledge about car customers</td>
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<tr>
<td>5. Global development requirements</td>
<td>6.</td>
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**“Striking the balance between manufacturing, quality and sales.”**

**“Assembly quality is a tricky thing that takes years to get right.”**

**“All in all, to keep customers satisfied with new products will be challenging.”**

**“Car customers cannot be treated by an arrogant business model as for example the way Apple treats its iPhone customers today!”**

**“The challenge that they mount against each other, as non-automotive new entrants majoring on much the same product advantages. And the possibility of a backlash against their dominance, which might even lead to their break-up.”**

**“Their biggest issue will be their willingness to accept car industry margins of at best 10 percent and at worst in the mid decimals. It’s not what they’re used to.”**

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“What will be the biggest challenges for tech companies (like Apple, Google, Amazon) to enter the car sector with their own vehicles?”
Content

1. Connected Mobility
   - New Challenges
     - Autonomous Driving
       - Infotainment System

2. Smart Efficiency
   - FCEV
   - BEV
   - Lightweight
Autonomous driving becomes increasingly visible in media

Significant increase in media coverage – peaks due to shows and individual events.

Global media analysis of all automotive coverage (Top 25 markets – top opinion leading media. Analysis unit: message contacts)
Increased exposure through special events and concept cars

Autonomous Driving at the CES 2015.
Autonomous driving wins further acceptance in 2015

Steep learning curve over the last three years, changing journalists’ perceptions – the once most-hated Advanced Driver Assistance feature has turned into one of the most admired features.

“How important and desirable is ‘Autonomous Driving’ from your point of view?”
Adaptive cruise control also wins further credit in 2015

Overall, safety-related driver assistance systems are evaluated much more positively than comfort features.

“Systems became much better in recent years”

Lesser degree of autonomy
Autonomous cars are expected within the next 4 years

The world car experts are anticipating autonomous cars in series production within the next four years.

“Which year do you expect to see fully autonomous driving cars in series production?”
# Autonomous driving not limited to luxury cars

By 2020, full autonomous driving will find its way to the full-size and luxury segment, while subcompact cars as well as leisure-orientated cars (*sports cars & convertibles*) will have a lesser degree of autonomy.

<table>
<thead>
<tr>
<th>Car Segment</th>
<th>Degree of Autonomy</th>
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<tbody>
<tr>
<td>Subcompact Cars (e.g. smart fortwo, Fiat 500)</td>
<td>No autonomy</td>
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<tr>
<td>Compact Cars (e.g. Ford Focus, VW Golf, Toyota Corolla)</td>
<td>Restricted to information &amp; warning systems</td>
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<tr>
<td>Mid-size cars (e.g. BMW 3-series, VW Passat)</td>
<td>Assist (e.g. adaptive cruise control)</td>
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<tr>
<td>Full-size cars (e.g. MB E-Class, Audi A6)</td>
<td>Full control (Autonomous driving)</td>
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<tr>
<td>Full-size luxury cars (e.g. MB S-Class, Lexus LS)</td>
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<td>Sports cars &amp; convertibles (e.g. Jaguar F-Type, Porsche 911)</td>
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> “From your point of view, what degree of autonomy will find its way to the different car segments by 2020?”
USA, Germany, Japan remain key autonomous driving markets

Due to high costs and the need for infrastructure, autonomous driving will be strongly pushed by the most developed car markets.

USA, Germany and Japan are clearly seen as the key markets for autonomous driving.
Safety is key to consumer acceptance of autonomous driving

However, Car-to-Car communications and ethics are also seen as roadblocks before autonomous driving can be integrated into the market.

"From your point of view, how challenging are the following aspects to enable autonomous driving?"
1. Connected Mobility
   › New Challenges
   › Autonomous Driving
   › Infotainment System

2. Smart Efficiency
   › FCEV
   › BEV
   › Lightweight
In-car electronics and connectivity increasingly more visible

Substantial increase in media attention for in-car electronics and connectivity.

- Start of intense infotainment communications.
- Start of keynote speeches at the CES.

3.3% of the total automotive product coverage in 2015 YTD is about infotainment systems / in-car electronics.

Global media analysis of all automotive coverage (Top 25 markets – top opinion leading media. Analysis unit: message contacts)
The most important infotainment feature – *smartphone integration* – means an integration of Apple and Google

A full smartphone integration also implies full audio integration and navigation and web access, making a lot of current features redundant.

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<tr>
<th><strong>Smartphone integration</strong></th>
<th>0</th>
<th>1</th>
<th>2</th>
<th>3</th>
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<tr>
<td><strong>Audio features</strong> (e.g. bluetooth streaming, webradio, satellite radio, USB-audio interface)</td>
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<td><strong>Navigation system</strong> (e.g. also for safety interaction, predictive route-data)</td>
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<td><strong>Web access</strong> (e.g. apps, web-based traffic information and infotainment, access to search engines)</td>
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<td><strong>Head-up display</strong></td>
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<td><strong>Communication features</strong> (e.g. e-mail functionality, communication apps)</td>
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<td><strong>Virtual cockpit / user-programmable instrument cluster</strong> (e.g. Audi TT)</td>
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<tr>
<td><strong>Voice control</strong></td>
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<td><strong>Touchpad / touchwheel</strong></td>
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<tr>
<td><strong>Operator services</strong> (e.g. for reservations, bookings, remote vehicle diagnostics)</td>
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<tr>
<td><strong>Wearables</strong> (e.g. smart watch connected to car)</td>
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<td><strong>Gesture recognition</strong></td>
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Google (Android) and Apple (iOS) together have more than 96% Global market share for smartphones (operating systems).

“Here is a list of in-car infotainment, communication, navigation and human/machine interface features. How important and desirable are the following features from your point of view?”

25
Domination of Google and Apple in the smartphone OS market

Windows phones and RIM OS only account for less than 4% of sales in 2013. While Symbian used to have more than 60% market share in 2007, it has now completely disappeared from the market.

World-wide smartphone sales (2013)

- **android**: 83%
- **iOS**: 13%
- **Other**: 4%

> 96% market share

http://en.wikipedia.org/wiki/Mobile_operating_system
OEM infotainment systems are still industry benchmark

However, Apple and Google are very close with their infotainment offerings and are much better-evaluated than the worst 5 OEM infotainment systems.

Best evaluated system (of premium manufacturer):

Top 5 OEM Systems

Apple ("CarPlay")

Google ("Android Car")

Microsoft ("Embedded Automotive")

Worst 5 OEM Systems

2015 Expert Panel

“From your point of view, how would you rate the infotainment systems of the following car manufacturers / tech companies?”
Content

1. Connected Mobility
   - New Challenges
   - Autonomous Driving
   - Infotainment System

2. Smart Efficiency
   - FCEV
   - BEV
   - Lightweight
**Smart efficiency / e-mobility** is the clear top trend of recent years

Smart efficiency dominates the top trends over the last four years.

<table>
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<td>2014</td>
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<td>2015</td>
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**Question:**

“What are the most important trends in the automotive industry in 2012 / 2013 / 2014 / 2015?”
No further decrease in oil price expected

The oil price is expected to return to the 2010-2014 average price of 100 USD per barrel no sooner than 2020.

“The oil price has dropped from $107.62 (average price per barrel 2010 – 2014) to $52.51 in 2015 (average price per barrel). Where do you think the oil price will end up in the following years (in USD per barrel)?”
The current low oil price sees negative impact on alternative fuel progression

Low oil prices lead to worries about slower progression in alternative fuels.

“Dampen public enthusiasm for alternative powertrains.”

“For me the most important impact of low oil prices is slowing down of work on hydrogen technology, however politicians would speed them up even against the will of OPEC, as hydrogen technology, fuel cells in cars etc. means independence from unstable or uncertain ‘partners’.”

“It would slow down the spread of fuel cell and electric cars, while further stimulating global warming.”

“Slowdown of increasing the capacity of the batteries, fuel cell development and other hi-tech technologies, renaissance of the high capacity engines especially in the USA.”

“What effect would a remaining LOW oil price have on the automotive industry in the coming years?”
Despite the low oil price, electric vehicles don’t lose momentum

Fuel cell electric vehicles gain biggest momentum in 2015, while all other electric powertrain options remain unchanged. However, for the first time, pure battery electric vehicles are seen as the least promising option.

“From your point of view, what are the most promising powertrain options regarding e-mobility?”
1. Connected Mobility
   - New Challenges
   - Autonomous Driving
   - Infotainment System

2. Smart Efficiency
   - FCEV
   - BEV
   - Lightweight
Fuel-cell technology ramps-up for a second time in 2014

In the last 10 years, Honda showed the strongest ambitions of all manufacturers regarding fuel cell technology, followed by Hyundai/Kia and Mercedes-Benz, and, more recently, Toyota.

**Fuel-Cell “Hype” period**
Most major manufacturers focus on FCEV as battery technology is not improving fast enough and the range issue, as well as high costs, are considered hard to solved.

**Attention-shift to BEV**
First volume BEVs appear on the market and the BEV hype begins. Manufacturers shift their focus on battery electric vehicles rather than continuing their FCEV strategy.

**Re-Focus on FCEV**
Manufacturers, especially Toyota & Hyundai/Kia, continue to focus on FCEV. In 2014, announcements of affordable FCEVs in series strongly increase.

**Comeback as “Next Generation EV”?**
FCEV in series (announcements):
Honda: 2016 | Daimler: 2017

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*Global media analysis of all automotive coverage (Top 25 markets – top opinion leading media. Analysis unit: message contacts)*
Toyota clearly dominates FCEV coverage in 2014/2015 YTD

But also Hyundai and Honda are highly visible with their fuel-cell technology.

"Just the fact that much of the industry doesn't have its eye on the technology." ...is seen as a threat.

"Gasoline succeeded in becoming ubiquitous in large part because there was a consensus among manufacturers and suppliers after a certain point. We're admittedly way off from that, but I don't exactly see fuel cells reaching that point any time soon."

100% = all fuel-cell coverage

Global media analysis of all automotive coverage (Top 25 markets – top opinion leading media. Analysis unit: message contacts)
FCEVs receive slightly less criticism than BEVs in Global media

Global media analysis of all automotive coverage (Top 25 markets – top opinion leading media. Analysis unit: message contacts)
Fuel-cell technology is combining the best of ICE and EV

Fuel-Cell technology has a chance of a comeback as the next-generation EV. “Zero emissions and manageable technology combine to provide what looks like long-term viability.”

Fuel Cell

- Long range
- Quick refuelling
- Limited weather impact
- Scalable to a wide range of vehicle sizes
- Zero emissions
- High fuel efficiency
- Instant torque
- Quiet
- Domestic fuel source

ICE

- Greenhouse gas emissions
- Imported fuel

BEV

- Limited range
- Charge time
- Packaging (battery space)
- Performance affected by weather
FCEV SWOT – a highly complex and controversial topic

<table>
<thead>
<tr>
<th>Strengths</th>
<th>Weaknesses</th>
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<tbody>
<tr>
<td>› Zero emissions (when driving)</td>
<td>› Infrastructure</td>
</tr>
<tr>
<td>› Range</td>
<td>› High emissions of conventional hydrogen production</td>
</tr>
<tr>
<td>› Ease and speed of refuelling</td>
<td>› High cost to produce fuel-cell stack</td>
</tr>
<tr>
<td>› Potentially cheap to run (cheap fuel)</td>
<td>› Complexity (more than just a battery pack and software)</td>
</tr>
<tr>
<td>› 'Normal' driving experience &amp; practicality in daily use (pure e-car in terms of driving)</td>
<td>› Explosion danger of the hydrogen.</td>
</tr>
<tr>
<td>› Comfort (like e-cars, especially quietness)</td>
<td>› Losing fuel while parking the vehicle for a longer period of time</td>
</tr>
<tr>
<td>› Fits within most modern “platforms”</td>
<td>(hydrogen can't be stored in a car without leak)</td>
</tr>
</tbody>
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<table>
<thead>
<tr>
<th>Opportunities</th>
<th>Threats</th>
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<tr>
<td>› Clean mobility</td>
<td>› Long lead-in time</td>
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<tr>
<td>› Urban driving during high pollution periods and access to zero-emission areas</td>
<td>› Low-level public information. Also, tech is too &quot;fancy&quot; for a seven-second soundbite</td>
</tr>
<tr>
<td>› Tightening government emissions regulations</td>
<td>› Recent u turn in the US (fracking) and low oil prices</td>
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<tr>
<td>› Free from „political economy”</td>
<td>› Just the fact that much of the industry doesn't have its eye on the technology</td>
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<tr>
<td>› Lesser dependence on oil</td>
<td>› Need for huge infrastructure investments: losing could be more than winning</td>
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<tr>
<td>› Combine the use of hydrogen cars with private home use, like heating/cooling systems. This would allow customers to fill up their cars at home from private resources. New ways of approaching power grid</td>
<td>› Taxation of hydrogen. High tax, high price. Risk that hydrogen fuel becomes a luxury issue</td>
</tr>
<tr>
<td>› Hydrogen generation in a clean way and in quantity: it has the potential to solve many of the car's problems. Development of the solar cells and other renewable energies could help to produce the hydrogen at lower costs and without emissions</td>
<td>› If governments relax emission regulations, need for FCVs will diminish and automakers will refocus on easier technologies.</td>
</tr>
<tr>
<td>› Commercial or public service vehicles as well as car sharing</td>
<td>› Regular EVs as well as advanced battery technology, hybrids and better internal combustion engines</td>
</tr>
<tr>
<td>› Perception of explosion danger of hydrogen</td>
<td>› Perception of explosion danger of hydrogen</td>
</tr>
</tbody>
</table>
Hydrogen infrastructure is the biggest challenge for FCEVs

While costs are an issue for both technologies, FCEVs are much less dependent on advanced battery technology and increased range.

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From your point of view, how much will the following factors influence the roll-out and success of Battery Electric Vehicles (BEV)?

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- Advanced battery / fuel-cell technology (BEV: cheaper batteries with higher capacity / FCEV: lower production costs, higher efficiency)
- Increased range
- Rapid charging possibility
- General charging / refuelling infrastructure / availability
- Decreasing purchasing costs
- Government incentives
- Stricter emission standards
- High oil price
- Lightweight technologies
- Low electricity costs / Low operating costs
- Fun to drive
- Clean electricity / hydrogen production
- New players on the market (e.g. Apple, Google or Amazon)
- Stagnating efficiency of diesel / petrol engines
- Increased popularity of car sharing

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Key markets for FCEVs are USA, Germany, Japan and South Korea

Linked to the involvement of Japanese, German, American and South Korean manufacturers in the FCEV technology, their home markets are seen as the key drivers for this new technology.

Which markets will be the key drivers for FCEV technology?
Hydrogen infrastructure is the key to FCEV success

Car sharing or new players won’t have any impact on the success of FCEVs. Interestingly, “Fun to drive” is also not seen as a key factor.

<table>
<thead>
<tr>
<th>Factor</th>
<th>-3</th>
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<th>1</th>
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<tbody>
<tr>
<td>Hydrogen refuelling infrastructure</td>
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<td>High oil price</td>
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<tr>
<td>Clean hydrogen production</td>
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<td>Lightweight technologies</td>
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<tr>
<td>Fun to drive</td>
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<tr>
<td>Stagnating efficiency of ICE</td>
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<tr>
<td>New players on the market</td>
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<td>Increased popularity of car sharing</td>
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“From your point of view, how much will the following factors influence the roll-out and success of Fuel Cell Electric Vehicles (FCEV)?”
## Praise for all fuel cell vehicles

FCEVs receive a lot of praise from the experts.

<table>
<thead>
<tr>
<th>Car Model</th>
<th>Rating</th>
</tr>
</thead>
<tbody>
<tr>
<td>Toyota Mirai</td>
<td>Mixed</td>
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<tr>
<td>Honda FCEV Concept</td>
<td>Mixed</td>
</tr>
<tr>
<td>Mercedes-Benz B-Class F-Cell</td>
<td>Very good</td>
</tr>
<tr>
<td>Audi H7 H-Tron</td>
<td>Very good</td>
</tr>
<tr>
<td>Hyundai ix35/Tucson FCEV</td>
<td>Very good</td>
</tr>
</tbody>
</table>

**“How would you rate the following FCEV from a general perspective?”**
“Pain-free, fuss-free – quite enjoyable, as is the experience of driving an electric vehicle.”

Overall positive driving experience of FCEV.

“**Impressed by how normal** it is to drive and how **production ready** it is.”

“They’re **impressive for their ease of driving, quietness, range and speed of refuelling.**”

“It’s an e-car and drives like an e-car.”

“**Completely unremarkable – just like a regular electric car.**”

“They are **uneventful and dull, overweight vehicles with futuristic pretensions, like most BEVs.**”

“[...] **a very good way to drive in terms of dynamics [...] no range problems and no battery issues, close to the ideal.**”

“It’s a different driving behaviour. You are more focussed on saving energy while driving than enjoying the fun of driving dynamics.”

“They remain, to my mind, a bit unrefined and in need of more work.”

“Have you driven a “Fuel Cell Electric Vehicle” (FCEV) yet? If yes, what was your experience?”
Content

1. Connected Mobility
   › New Challenges
   › Autonomous Driving
   › Infotainment System

2. Smart Efficiency
   › FCEV
   › BEV
   › Lightweight
BEVs with substantially increasing visibility in 2014/2015

After the slowdown in 2012/2013, BEVs are now seeing a substantial increase in media visibility, pushed by a variety of new battery electric vehicle models.

“There’s a massive social pressure for BEVs, including urban infrastructure design and community status – watch how many people stop wearing fur coats and stop throwing plastic in the garbage.”

Global media analysis of all automotive coverage (Top 25 markets – top opinion leading media. Analysis unit: message contacts)
Visibility of BEVs is pushed by Tesla Model S and BMW i3

Out of a huge variety of BEV models in 2014-2015 YTD, the Tesla Model S and BMW i3 combined account for more than 2/3 of all coverage. Almost every third battery electric vehicle story is about either one of them.

Top 5 models account for more than 50% of total BEV coverage in 2014/15

100% = Total electric vehicle coverage in 2014/2015 YTD
Norway: Tesla achieves an 11% market share in March ‘14

Exponential growth of EVs in Norway; especially the Tesla Models S due to generous government subsidies.

- The EV market in Norway grew by 130% in 2014 compared to previous year.
- No purchase tax, no VAT and no tolls are making EVs very attractive.
- Free and extra parking areas for EVs.
- EV infrastructure.
- Clean Norwegian energy production.
Germany and USA with limited e-mobility momentum

The former benchmark market for E-Mobility, Japan, somewhat loses the confidence of the expert community and remains on one level with Germany and the USA.

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<tr>
<td>Norway</td>
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<td>Japan</td>
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<tr>
<td>Germany</td>
<td></td>
<td>Ambitious plans:</td>
<td>Limited momentum</td>
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<td>5 million e-cars in 2020</td>
<td>Limited momentum</td>
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<td>France</td>
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<tr>
<td>China</td>
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<tr>
<td>USA</td>
<td>Limited momentum</td>
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<td>UK</td>
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<td>Spain</td>
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</tbody>
</table>

“Which markets will be the key drivers for e-mobility?”
Advanced battery technology and increased range are key

Interestingly, clean energy production is not seen as a crucial factor for the further roll-out of battery electric vehicles.

From your point of view, how much will the following factors influence the roll-out and success of Battery Electric Vehicles (BEV)?

- Advanced battery technology
- Increased range
- Rapid charging possibility
- General charging infrastructure
- Decreasing purchasing costs
- Government incentives
- Stricter emission standards
- High oil price
- Lightweight technologies
- Low electricity costs
- Fun to drive
- Clean electricity production
- New players (e.g. Apple, Google)
- Stagnating efficiency of ICE
- Increased popularity of car sharing

The ease of access to charging points that work. Not only are many more needed, but they need to be in convenient places, and a charger available when you arrive at one. Which works. Real-world practicalities like these are underestimated.

If manufacturers stopped telling lies about the range of their vehicles they would have more credibility. Such lies have brought the pure-EV game into disrepute.

2015 Expert Panel
Tesla & BMW continue their outstanding EV reputation in 2015

BEVs gain further credit in 2015 due to i3 and Tesla Model S – Premium electric vehicles might be the game changer in the future.

“How would you rate the following e-cars from a general perspective?”

First Generation and low budget electric vehicles

Second generation and compact electric vehicles

Premium electric vehicles

very poor  mixed  very good

1. Tesla Model S
2. BMW i3

2014 Expert Panel
2015 Expert Panel
Content

1. Connected Mobility
   › New Challenges
   › Autonomous Driving
   › Infotainment System

2. Smart Efficiency
   › FCEV
   › BEV
   › Lightweight
Lightweight coverage on a somewhat constant low level

Promises vs. facts: Coverage about lightweight/materials within the product strategy never took-off in Global media. What counts in the end is the simple and totally transparent ‘curb weight’ of a vehicle.

Lightweight demand for better range during e-car hype
Focus shifts away to more efficient engine technology rather than coverage about weight reduction

Global media analysis of all automotive coverage (Top 25 markets – top opinion leading media. Analysis unit: message contacts)
Tonality of actual curb weight on constant rather critical level

Weight is one of the most critical product aspects in Global media and hasn’t stagnated over the last 7 years in terms of tonality.

Every third car is being criticized for its weight

- Global media analysis of all automotive coverage (Top 25 markets – top opinion leading media. Analysis unit: message contacts)
# Smart material-mix is the most promising weight saver

Two important shifts in perception – the Ford F150 and Jaguar XE for aluminium and the BMW i3 for carbon fibre.

<table>
<thead>
<tr>
<th>Material-Mix</th>
<th>Clever material mix is seen as the most promising technology for further weight saving in the automotive industry.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Carbon Fibre</td>
<td>The BMW i3 has changed the perception of carbon fibre: from an expensive and exclusive to an affordable, mass-market material for weight-saving.</td>
</tr>
<tr>
<td>Aluminium</td>
<td>The new Ford F-150 as well as the Jaguar XE shift the image of aluminium from a rather exclusive to a more volume material for weight-saving.</td>
</tr>
<tr>
<td>High Strength Steel</td>
<td>High strength steels are still evaluated very positively, but are seen as a kind of maxed out option for weight saving due to the already widespread use within the industry.</td>
</tr>
<tr>
<td>Downsizing of Engines / Powertrains</td>
<td>The actual downsizing of an engine for weight reduction has lost slight momentum compared to last year, but is still evaluated very positively.</td>
</tr>
</tbody>
</table>

> "From your point of view, what are the most promising lightweight technologies?"
Suppliers with substantial influence on lightweight technologies

... through closer cooperation with the OEMs together with significant research & development in the field.

"Suppliers are contributing significantly in developing lightweight technologies?"

"There is a trend towards an even closer cooperation between OEMs and their supplier in order to achieve innovative solutions."