DROWNING IN TECH?

IMPLICATIONS FOR DEALERS OF THE TECHNOLOGICAL WAVES SWEEPING OVER THE AUTOMOTIVE INDUSTRY

Glenn Mercer

Dealer Forum – Philadelphia Auto Show

February 2, 2016

Agenda

- **Introduction**
  - Purpose of this talk, my credentials, forecasting issues
- **Observations**
  - Nature of change, three-part change framework
- **Implications**
  - Impact to date, implications for dealers

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Purpose of this talk

"Hey Glenn, could you discuss:

- Connected cars,
- Driverless cars,
- Ridesharing services,
- … and any other technologies we should be worried about
- … with implications for dealers.

You've got 45 minutes."

No problem!

Speaker credentials

- Consulting: two decades at McKinsey & Co. (automotive)
- Public equities: Alliance Bernstein retainer
- Private equities: Greenbriar, KKR, Sterling, others
- Venture capital: Kleiner Perkins, others
- Academia: Director, IMVP*; member, GERPISA, others
- Automotive Products: Director at Stackpole, Grakon, &tc.
- Automotive Services: AB Ricardo Consulting (former)
- Journalism: *Supplier Business, Auto Retail Network, &tc.*
- *Owns a car*

* International Motor Vehicle Program

Forecasting issues: people tend to over-predict change.

This is despite a history of failed predictions, including about cars.


WEDNESDAY, DECEMBER 8, 1926.

OM AUTO'

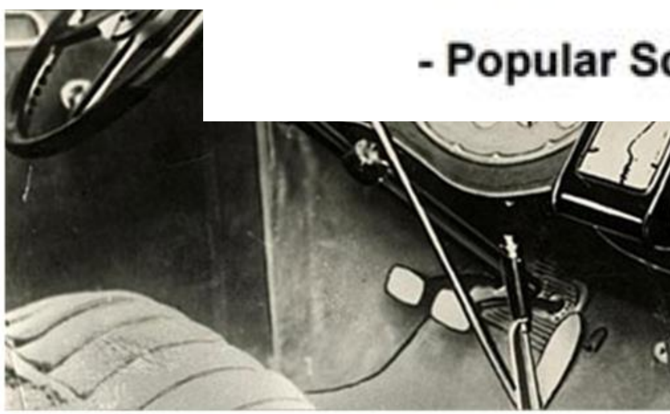
TOUR CITY

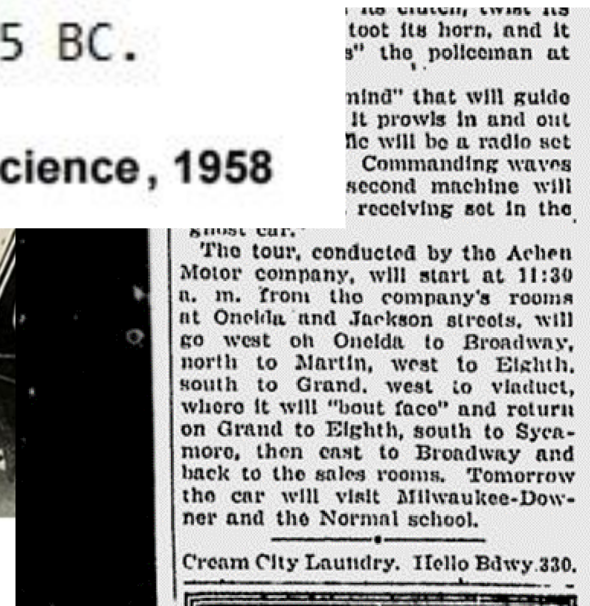
"Like it or not, the robots are slowly

- Popular Science, 1958

"In an effort to limit traffic congestion, the government banned vehicular traffic in Rome's city center, from 6 AM to 4 PM."

By order of Julius Caesar, in 45 BC.




toot its horn, and it
s" the policeman at

mind" that will guide
it prowls in and out
le will be a radio set
Commanding waves
second machine will
receiving set in the
ghost car.

The tour, conducted by the Achen Motor company, will start at 11:30 a. m. from the company's rooms at Oneida and Jackson streets, will go west on Oneida to Broadway, north to Martin, west to Eighth, south to Grand, west to viaduct, where it will "bout face" and return on Grand to Eighth, south to Sycamore, then east to Broadway and back to the sales rooms. Tomorrow the car will visit Milwaukee-Downer and the Normal school.

Cream City Laundry. Hello Bdwy.330.

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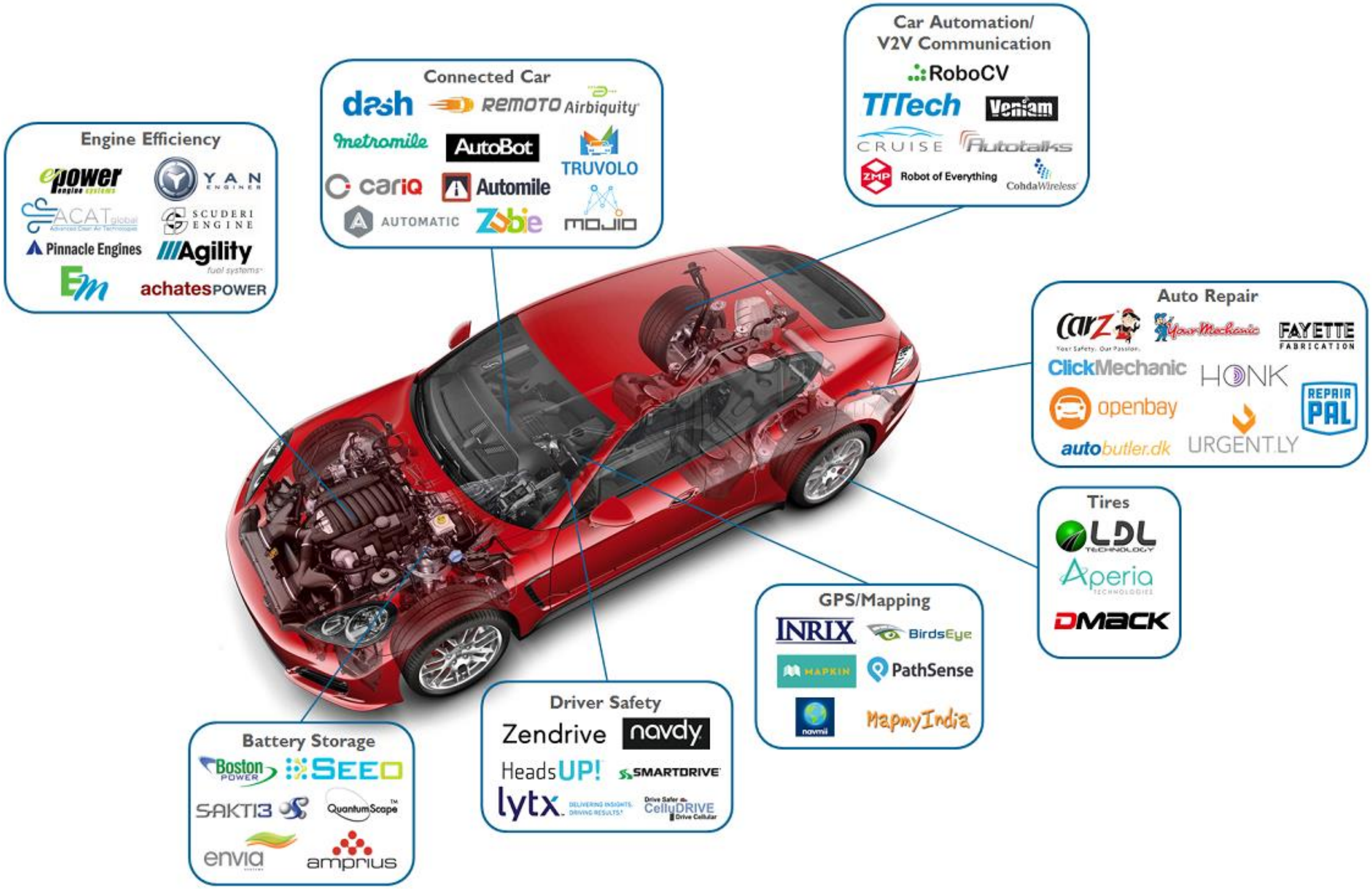
Drivers of change: Silicon Valley rediscovers the car…



Source: CB Insights

… and Detroit discovers Silicon Valley.

This is because in some ways software is "eating the car"*

- The cost of electronics and software in autos was <20% of the total cost a decade ago. Today it is as much as 35%.
- "More importantly, electronics systems now contribute more than 90% of innovations and new features." (Broy)
- Lines of code in Hubble Telescope: 2 million; Chrome 9; Android 12; LHC 50; typical new car 100 mm (McCandless)
- New cars use 30-80 ECUs with more than 150 mm object code instructions, for well over 1 gigabyte of software in a premium car. "Value creation in cars today is primarily determined by embedded software" (Ebert)

* With apologies to Mark Andreessen

Sources: Manfred Broy (TU Munich), David McCandless (UK journalist), Christof Ebert (Vector Consulting); Ford

And while we are used to change in the automotive industry…

Materials	Parts	Mfg	Dist	Repair	Recycle
Aluminum displaces cast iron and makes inroads against steel Plastics gain share in interiors Carbon fiber is making a move Magnesium content is growing, from a low base Lithium becomes a key material	Smallest suppliers have exited Remaining suppliers consolidate vertically: horizontal mega-suppliers break up OEMs reduce vertical integration (except Tesla) Electrification of the car reshapes the supply base. Globalization grows dramatically and then plateaus	Toyota Production System "changes the world" BTO doesn't advance as much as predicted. Modular assembly conquers seats, IPs, FEMs, then stalls OEMs fail to consolidate: scale is not everything.	Dealership system globally dominant but mutates Internet takes over car shopping, not yet transactions Chinese fail to export. Public dealer chains stall out: economies seem regional rather than national. Rapid growth in BRICs now cooling	Aftermarket "peels off" work from dealers and their OEMs: increased complexity was to drive business to dealers, does not DIY erodes…but does not die. ADAS may start to erode insurance business.	Increasingly professional, consolidated, globalized: - Auctions - Salvage - Recycling - Used car remarketing CarMax transforms used-car sales, but only in the USA. Recycling rate in cars crosses 90%.

… today change acts on the (overlooked) USAGE link in the chain

Materials

What:
Steel
Iron
Aluminum
Plastics

Who:
Several hundred firms

Globalization:
High

Profitability:
Moderate

Parts

What:
T 1 assemblies
T 2 components
T 3 parts

Who:
Tens of thousands

Globalization:
Moderate

Profitability:
Moderate

Mfg

What:
Design and manufactures of light duty vehicles

Who:
Two dozen majors

Globalization:
High

Profitability:
Low

Dist

What:
Distribution marketing retailing of cars

Who:
>100,000 dealers

Globalization:
Low

Profitability:
High

Usage

What:
Activities in and around the car except repair

Formerly just insurance and rental. Now a new wave of IT-enabled “usa
monetiz

- App
- Autono
- UBI

Identity, location, profitability all wildly varying

Repair

What:
- Maintenance
- Repair
- Collision

Who:
>1,000,000 firms

Recycle

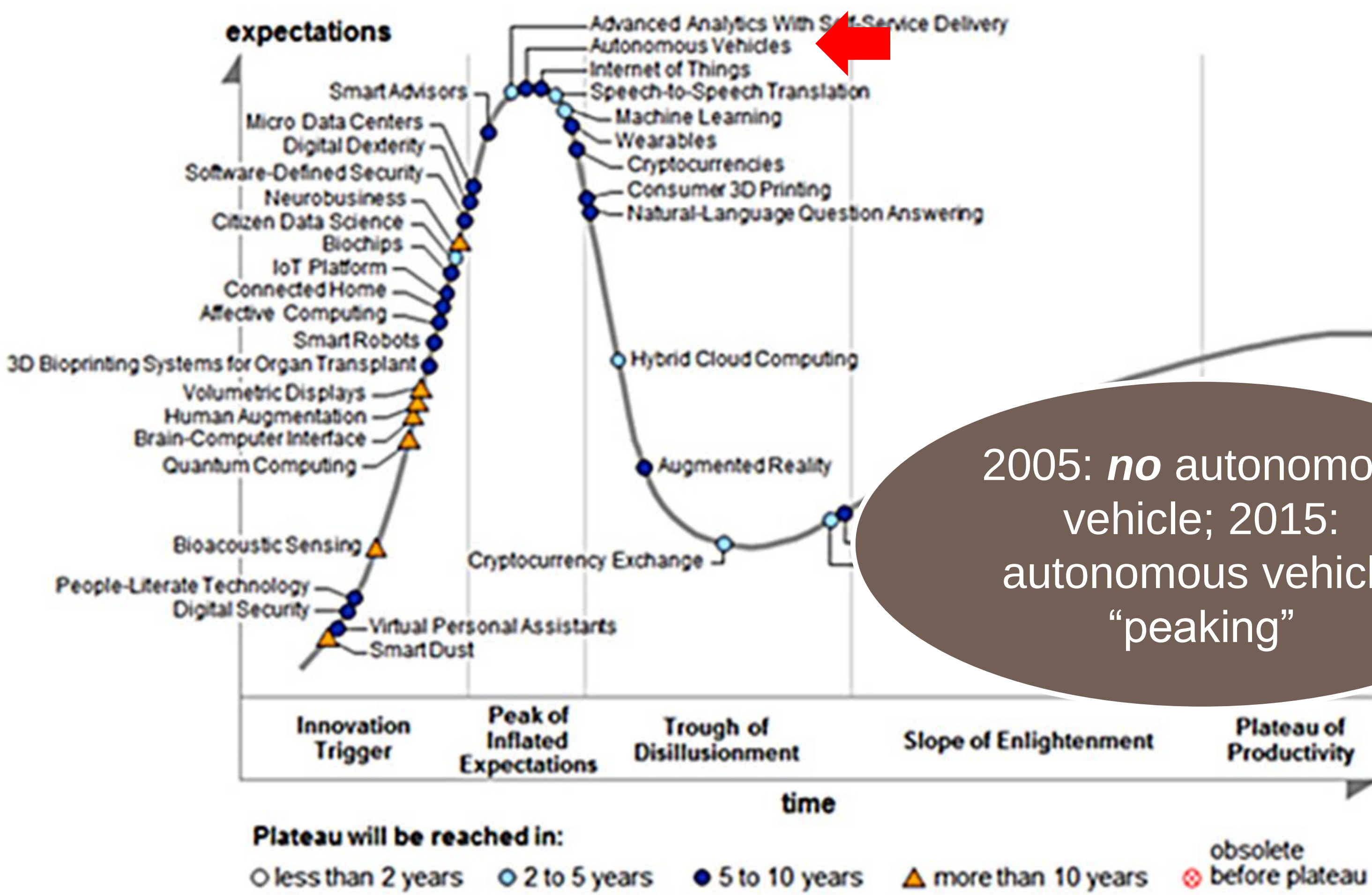
What:
Handling the car after first owner: remarket, recycle

Who:
>10,000? Firms

No more “Buy and Bye!”

Worse, it has seemingly come "out of nowhere"

GARTNER TECHNOLOGY HYPE CYCLE



2005: ***no*** autonomous vehicle; 2015: autonomous vehicle "peaking"

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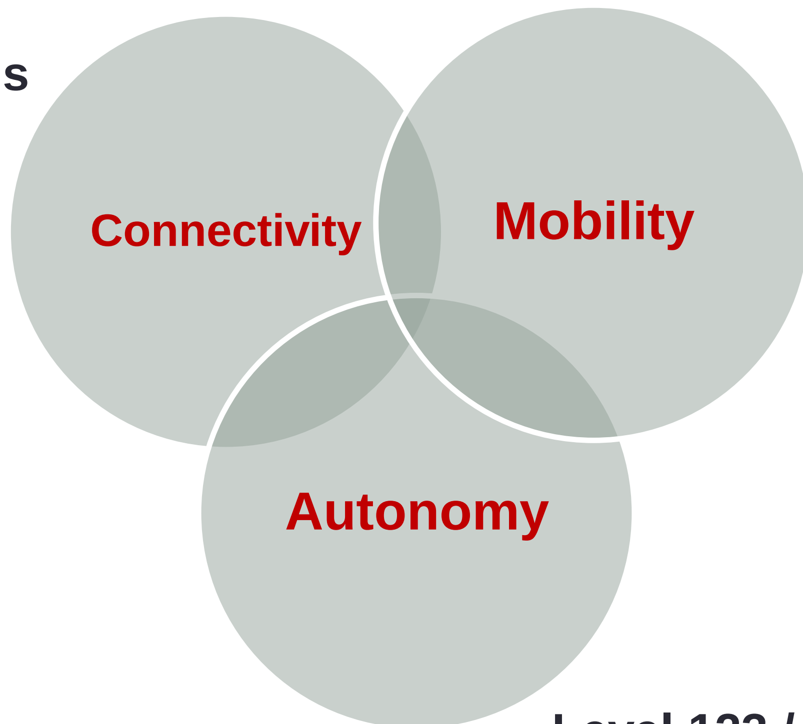
Framework: boil it all down to connectivity, mobility, autonomy

NEW AUTOMOTIVE TECH "GRAND UNIFIED THEORY"

Apple CarPlay
Android Auto
OTA Updates
Internet of Things
V2V V2I etc.
Music
UBI
Phone & text
Wifi hotspot…..

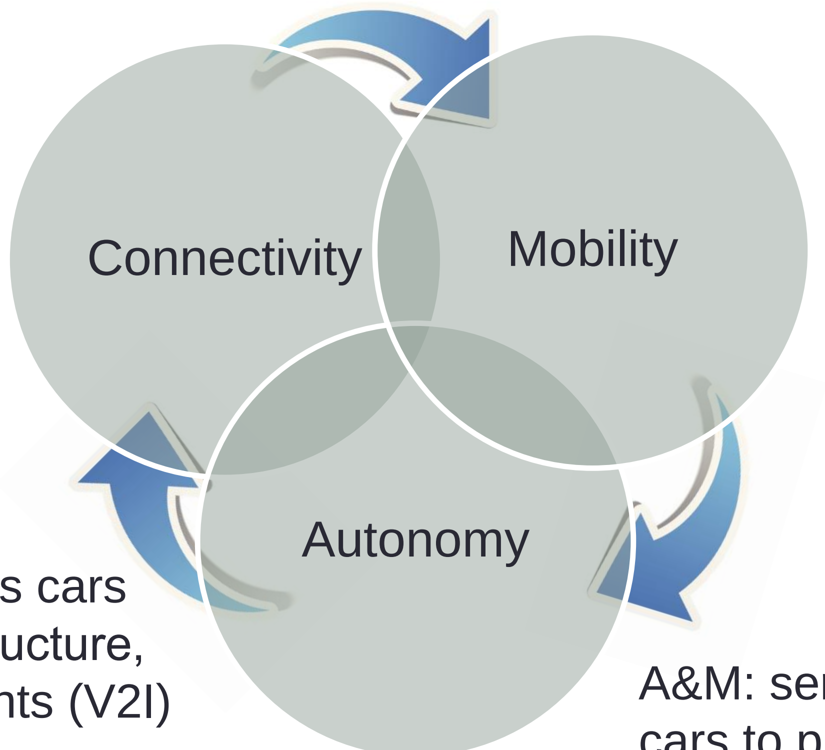


Carshare (ZipCar)
TNC (Uber, Lyft)
Pooling (UberPool)
Taxi apps
Delivery (Instacart, Doordash, Postmates)

Level 123 / ADAS
Level 45 partial/full autonomy
Driverless cars

The three fields potentially reinforce each other.

C&M: car communicates availability to mobility app (Uber today)



C&A: autonomous cars “talk” with infrastructure, such as traffic lights (V2I)

A&M: service uses driverless cars to provide its ride services (Uber tomorrow)

Connectivity – the theme is *complexity*: what to connect?

INVENTORY OF CONNECTED-CAR APPLICATIONS

Connectivity | Mobility | Autonomy

Table 1: National *ITS* Architecture Products & Services

Traffic Management Market Sector — *ITS* examples:
1. Freeway & Arterial management systems
2. Active Traffic Management Systems
3. Traffic Decision Support & Demand Management Systems
4. Traffic Management Roadside Hardware / Software
5. Traffic Incident Management Equipment / Systems
6. Roadway Weather Information Systems (RWIS)
7. Traffic Detectors / Surveillance Equipment
8. Traffic Probes
9. Signaling and Control Devices
10. Intersection Cabinet Safety Devices / Components
11. Battery Backup / Uninterruptible Power Supply systems
12. Roadway Closure Equipment / Systems
13. Dynamic Message Signs (DMS)
14. Electronic Toll Collection Equipment
15. Electrical Lighting & Manage
16. Drawbridge Managem
17. Emissions Monit
18. Speed Monito
19. Variable Sp
20. HOV Lan
21. Mainline
22. Reversi
23. Metering
24. Regional
25. Parking Fac
26. Asset Manage

Cross-Cutting & Other
1. Communications
2. Systems Integration
3. Systems Engineering

Archived Data Management Sector — *ITS* examples:
1. *ITS* Data Collection & Management
2. *ITS* Data Warehouses

Public Transportation Market Sector — *ITS* examples:
1. *ITS* Archived Data / Business Intelligence Systems
2. Voice / Data Communications Systems
3. Computer-Assisted Dispatch (CAD) Systems
4. Automatic Vehicle Location (AVL) System for Buses
5. Automated Train Location System (ATLS) for Rail Transit
6. Transit Signal Priority (TSP) Systems
7. Connection Protection / Notification Systems
8. Positive Train Control
9. Automated Vehicle Monitoring (AVM)
10. Automatic Passenger Counting (APC) System
11. Transit Travel Information (TTI) Systems

Emergency Management Market Sector — *ITS* examples:
1. Early Warning System Alert & Advisory Systems
2. Emergency Call-Taking & Dispatch Services
3. Emergency Routing Equipment Systems
4. Emergency Signal Preemption
5. Transportation Infrastructure Protection Systems
6. Roadway Service Patrols
7. Mayday & Alarms Support Systems/Equipment
8. Wide-Area Alert Systems
9. Disaster Response & Recovery Equipment / Systems
10. Disaster Traveler Information Systems / Software
11. Evacuation & Reentry Management Systems / Software
12. Telemedicine Applications / Systems

Mgmt — *ITS* examples:

Clarus

Route Guidance

Guidance

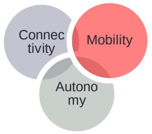
Dynamic Route Guidance
9. Dynamic In-Vehicle Signing
10. Static In-Vehicle Signing
11. Yellow Pages and Reservations Services

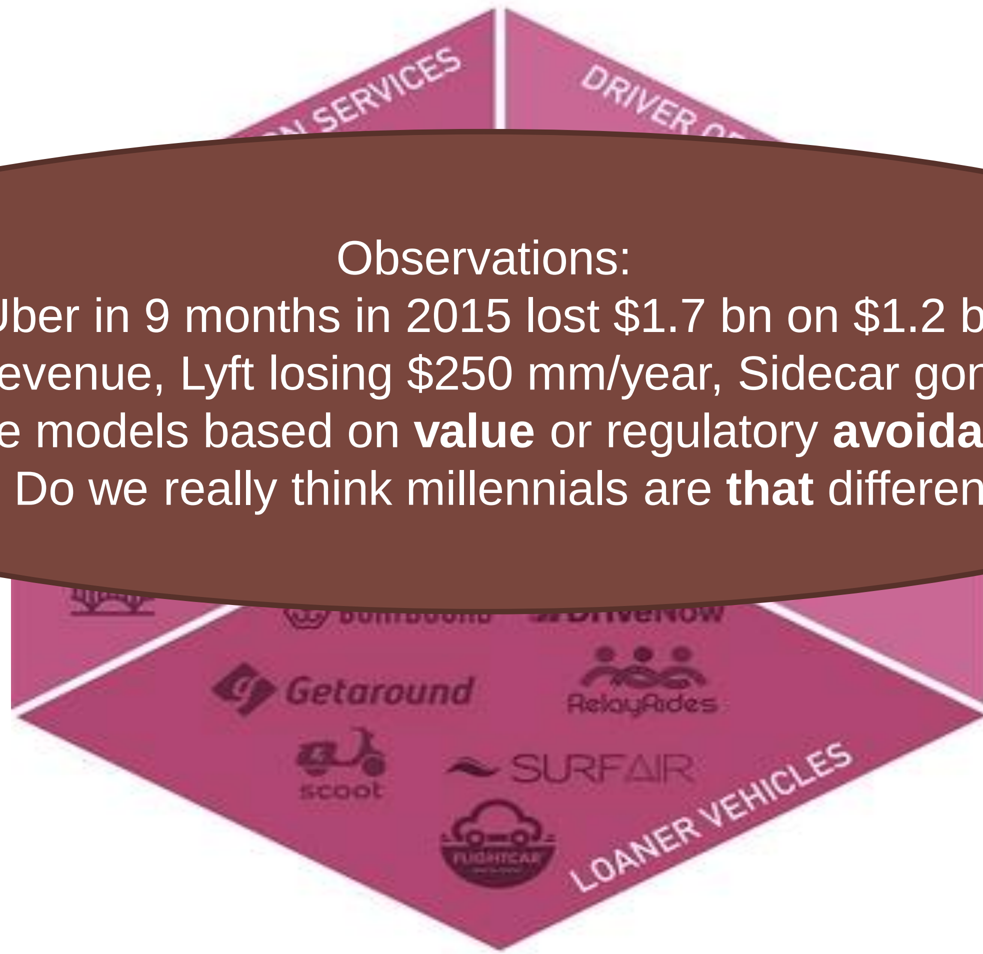
Observations:
1. It's a crowded field, hard to see a "killer app"
2. Many of these are "answers looking for questions" (check the fridge from your VW van?)

OEMs need to focus, not just invest in all.

Source: ITS America

Mobility – the theme is *value*: how much is this worth?
INVENTORY OF MOBILITY APPLICATIONS





Observations:

1. Uber in 9 months in 2015 lost $1.7 bn on $1.2 bn in revenue, Lyft losing $250 mm/year, Sidecar gone...
2. Are models based on **value** or regulatory **avoidance**?
3. Do we really think millennials are **that** different?

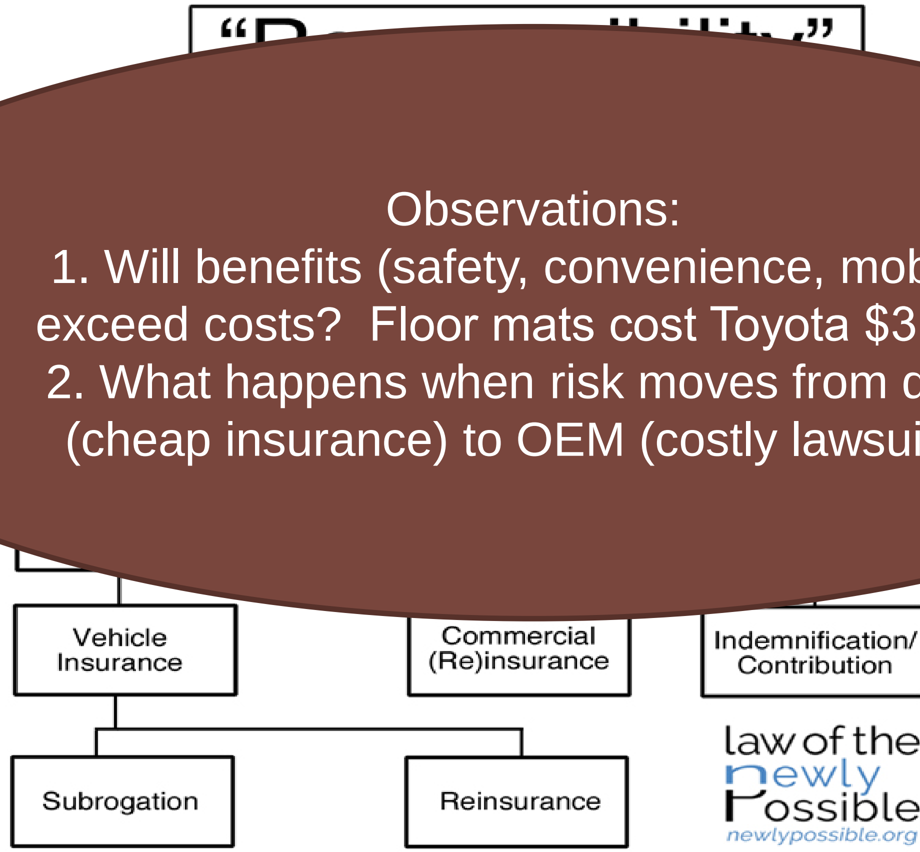
Full autonomy – the theme is *risk*: what can go wrong?

INVENTORY OF VEHICLE RESPONSIBILITIES

Connec tivity
Mobility
Autono my

Observations:

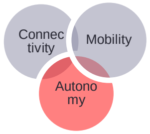
1. Will benefits (safety, convenience, mobility) exceed costs? Floor mats cost Toyota $3 bn…
2. What happens when risk moves from driver (cheap insurance) to OEM (costly lawsuits)?



law of the newly Possible
newlypossible.org

Risks of fully-autonomous (L45) vehicles

THE RISK OF A "HINDENBURG MOMENT"

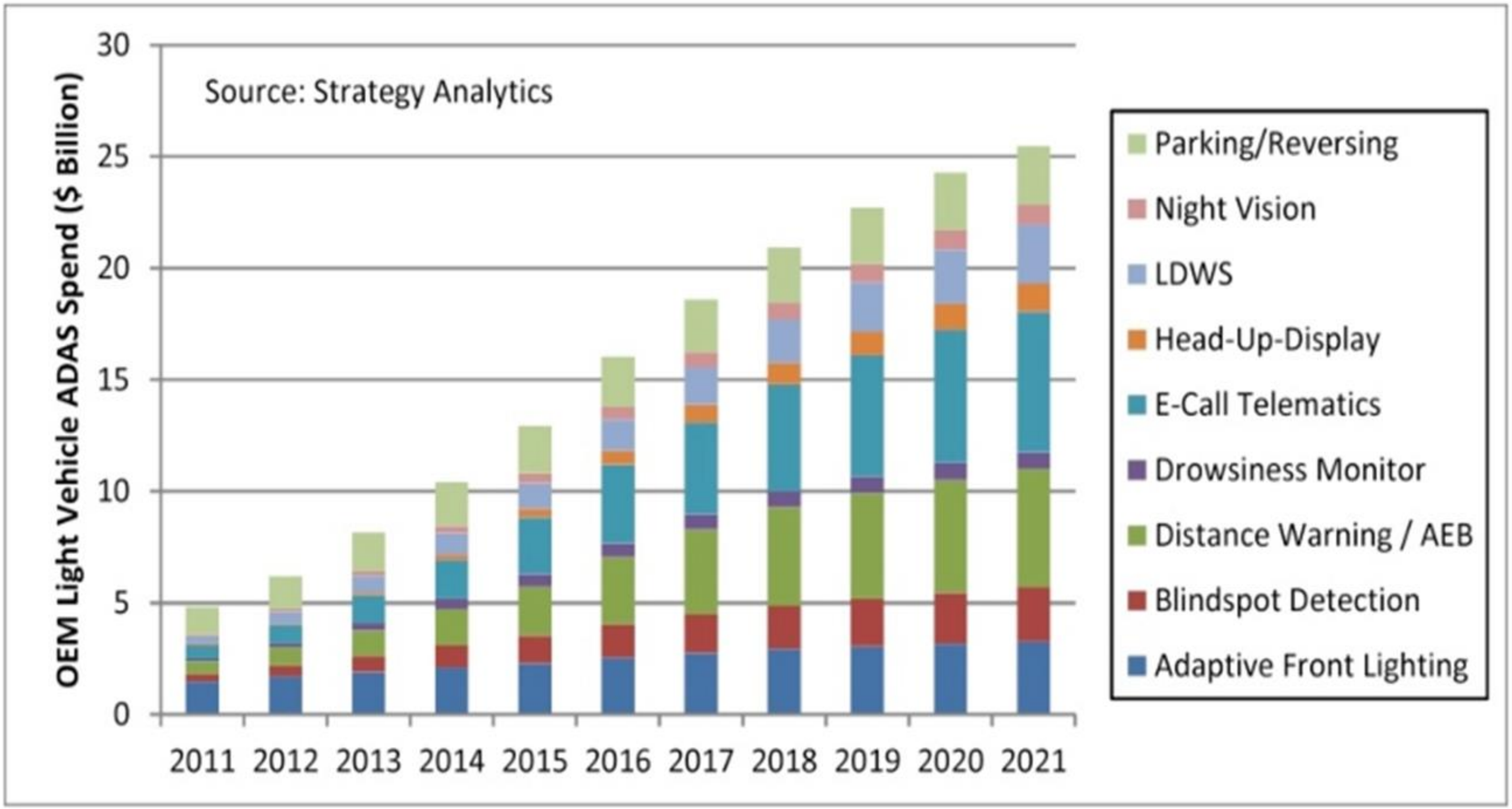


ISIS rigs remote-control car bombs to beat detection systems

Heat-Emitting Mannequins Could Fool Infrared Cameras

However, in *partial* (L123) autonomy, the growth is clear

ADAS SPEND FORECAST



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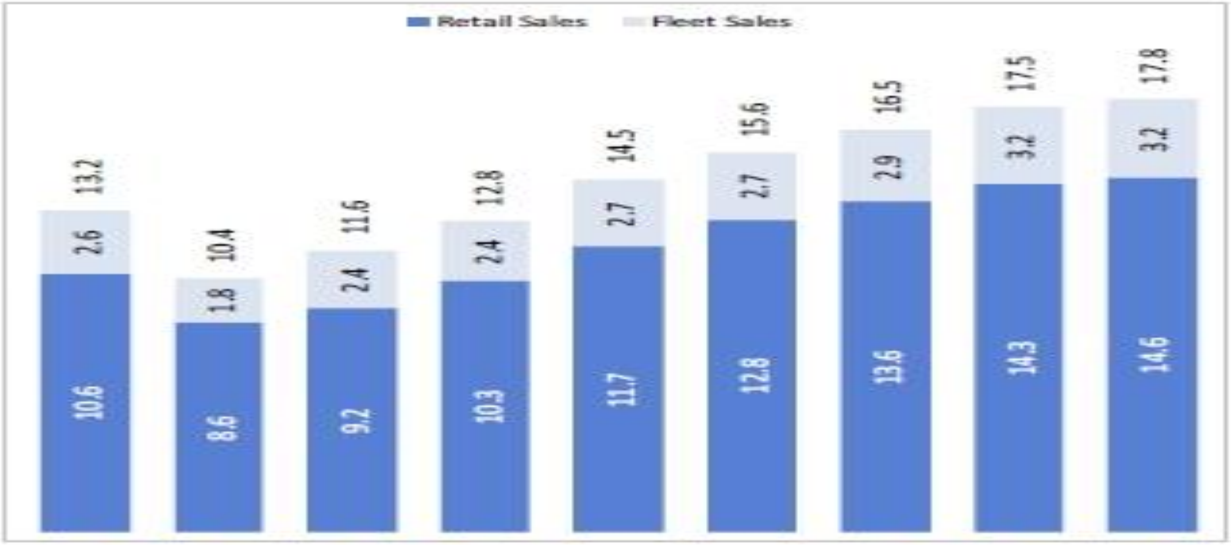
Impact to date: no effect on USA sales *yet*

USA ANNUAL SALES 2008-2015, 2016 FORECAST



SAAR (MM)	2008	2009	2010	2011	2012	2013	2014	2015 F'cst	2016 F'cst
Total	13.21	10.42	11.57	12.76	14.47	15.57	16.49	17.46	17.77
Retail	10.60	8.63	9.18	10.32	11.73	12.84	13.56	14.29	14.57
Sales (MM)									
Total Sales	13.21	10.42	11.57	12.76	14.47	15.57	16.49	17.46	17.77

Source: J D Power

And other “disrupted” fields seem relatively unscathed

- ❖ Despite AirBnB, American hotel occupancy rate (65%) is the highest it has been since records started being kept (27 years)
- ❖ Despite Uber, taxi license applications in San Francisco have been rising steadily
- ❖ Despite Amazon, the number of independent bookstores in the USA is up 25% since 2009

Source: press reports

Uber versus taxis: meeting in the middle?

In San Francisco: 80% of taxi fleets have signed up with Flywheel “hailing app;” 50% of taxi license applicants are former Uber/Lyft drivers; regulations are starting to converge

Source: press reports

But perhaps the impact is not revenue *lost*, but revenue *never had*

AUTO INDUSTRY HAS LOST THE LAST THREE ROUNDS OF CONSUMER TECHNOLOGY “WARS”

In-car communication: lost to phones

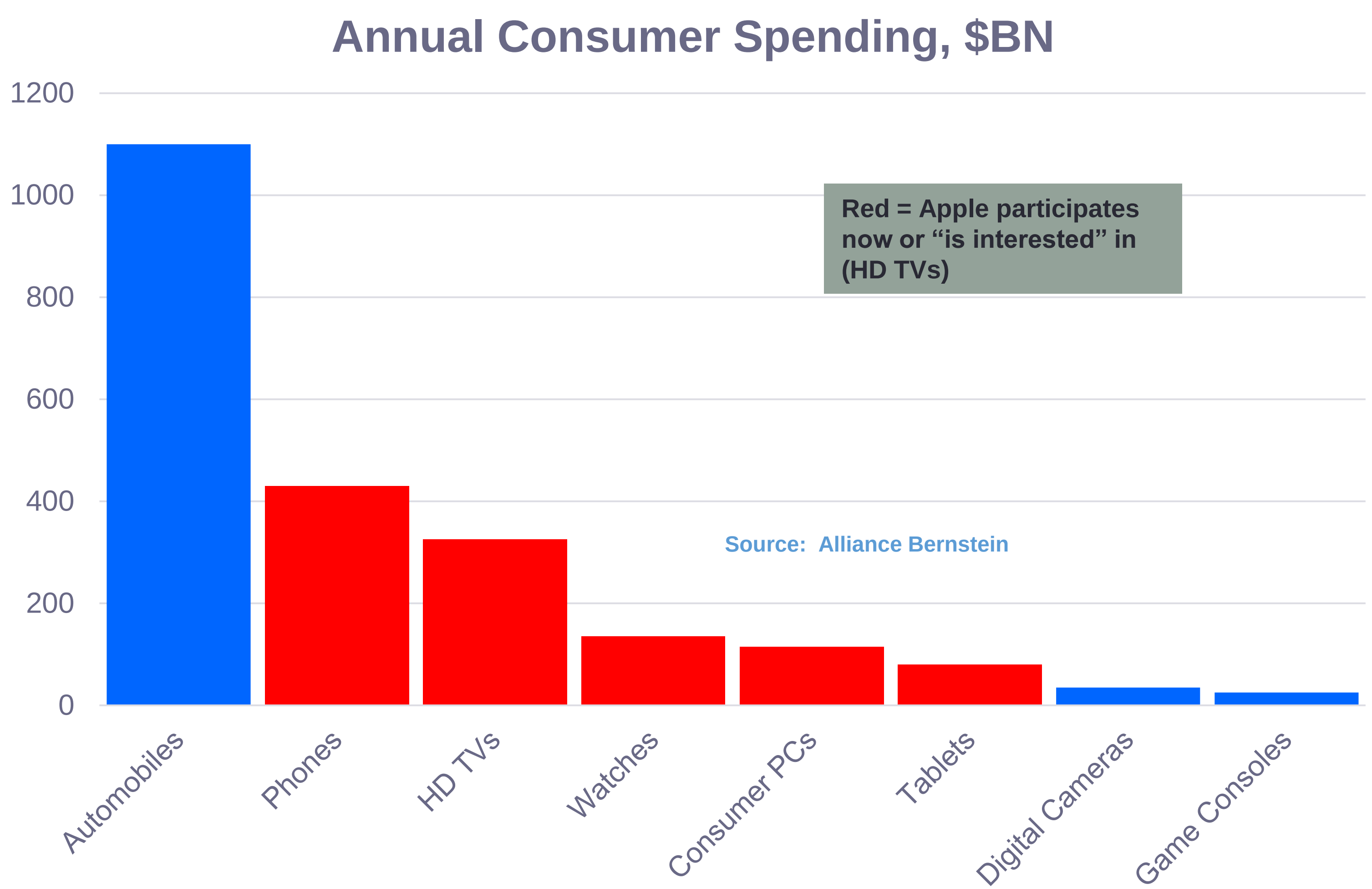
Were OEMs so aggressive at CES just to show that ***this time*** they will not lose again?

to phones

Total market size: unknown billion$

While outside players may develop supply and *create* demand…

EXAMPLE OF APPLE: ONLY CARS COULD "MOVE THE NEEDLE" FOR THEM?



… and they have the money to fund their efforts.

Apple's 'Project Titan' at crossroads, team in hiring freeze, source says

By Sam Oliver
Monday, January 25, 2016, 09:06 am PT (12:06 pm ET)

Apple has placed a hiring freeze on the team responsible for the company's nascent automotive ambitions after executives became unhappy with the project's direction and progress, AppleInsider has learned.

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Implications for Dealers: General

1. You’ve got time… plan, but don’t panic
2. Don’t confuse “can” and “will” … press releases ≠ action
3. Turn this to your advantage … as you always have

Plan, but don't panic

EXAMPLE: AUTONOMOUS VEHICLE PENETRATION

If we assume:

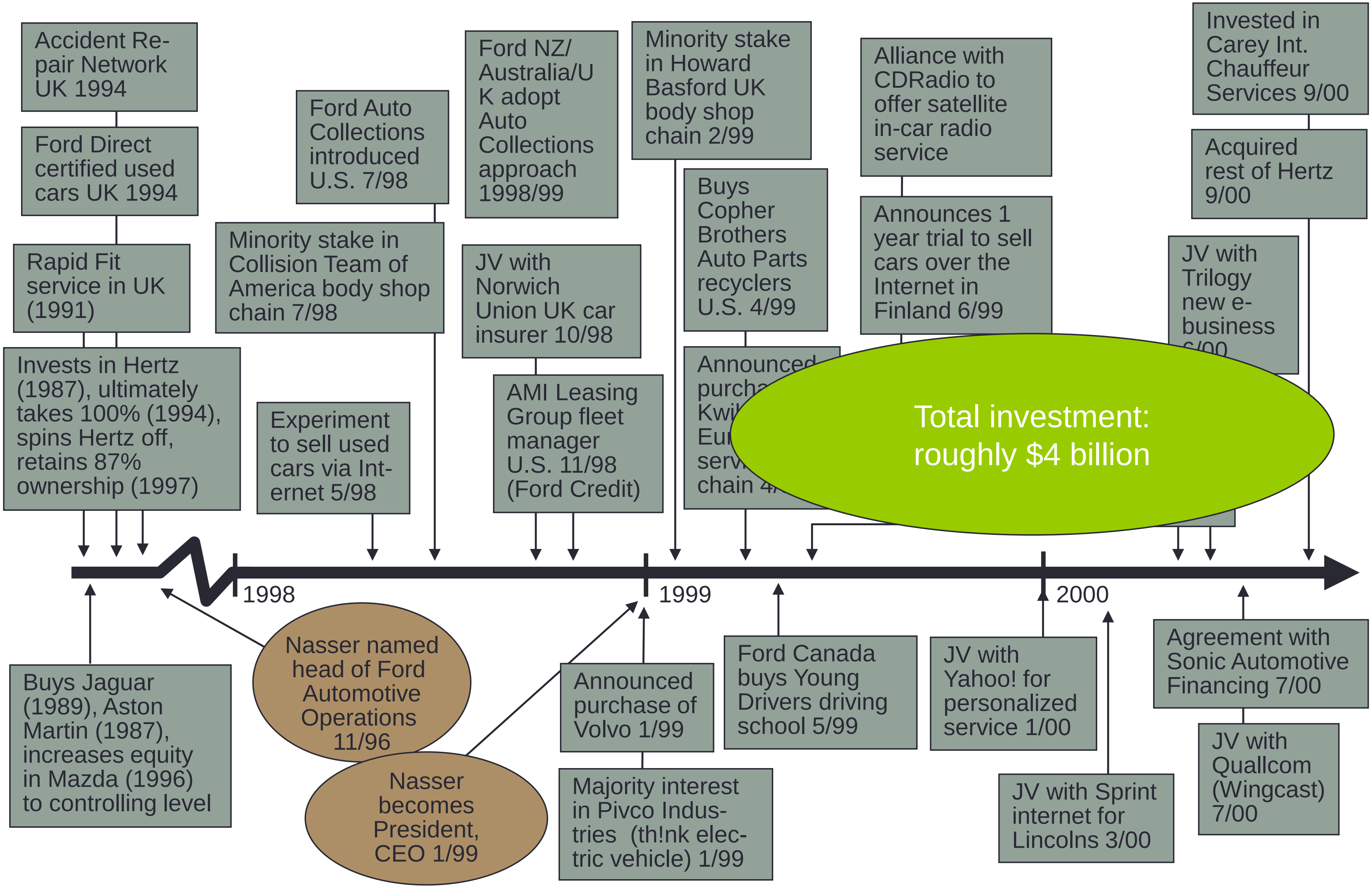
1. By 2020 there are sold 1 million fully-autonomous (Level 45) vehicles annually (far beyond any forecast)...
2. Every year after 2020 that number goes up by 1 million (beyond any non-speculative forecast)...
3. Eve ... on cars...
4. Le ... eet until after 2030.

But remember today there are more written reports on L5 Avs, than there are L5 Avs

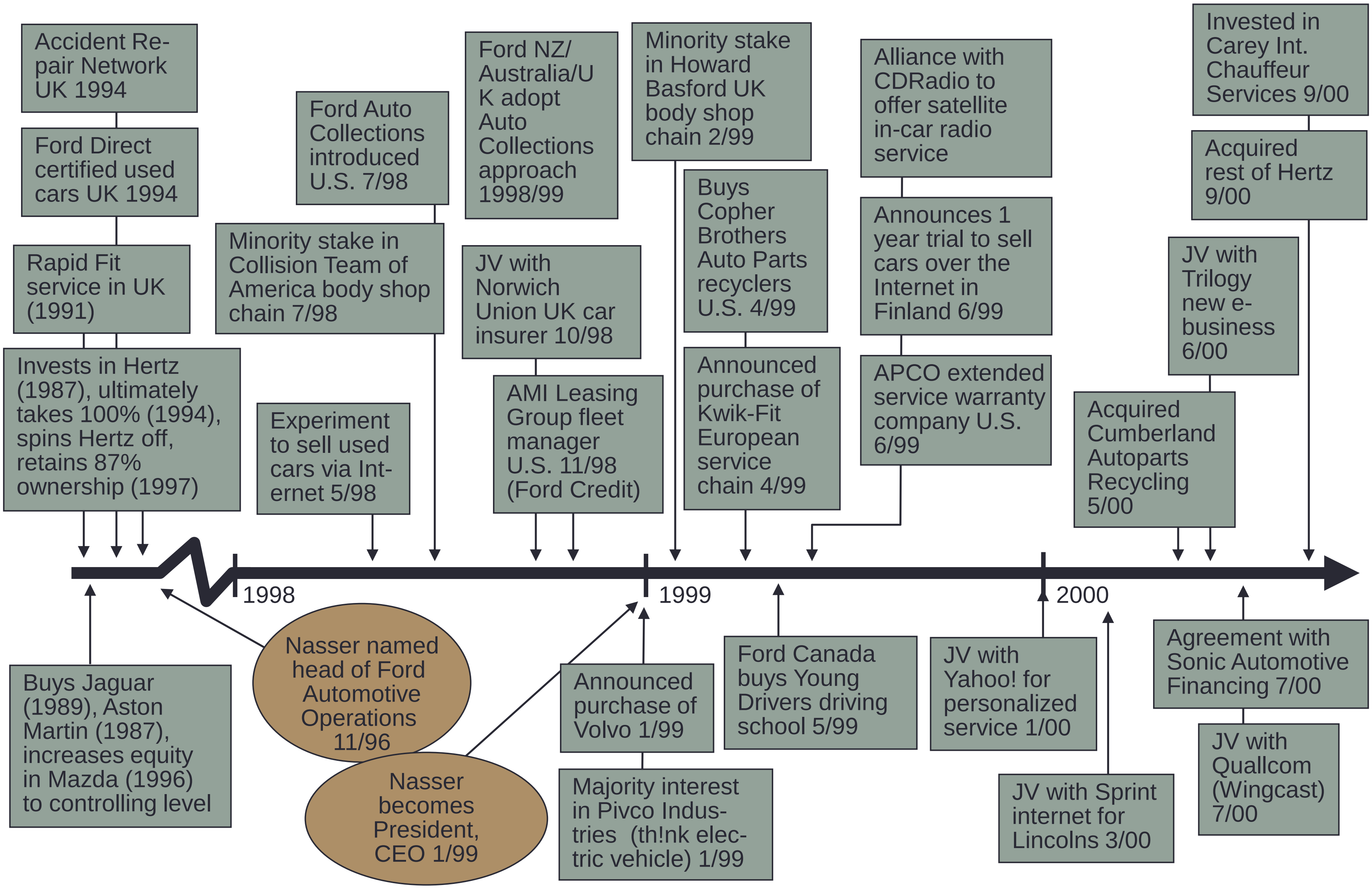
And *this* assumes that regulators approve, the legal system adapts, customers pay, and technology works.

Do not confuse can and will, *activity* for *achievement*!

CASE EXAMPLE: THE FORD 1990'S MOVE DOWNSTREAM



Which did Ford keep? Projects can be ended as well as started.



Turn this to your advantage, as you always have: 3 examples

- Past threat #1: "Attack of the public chains" – Huizenga-era AutoNation, with end-to-end integration (e.g. rental fleets as in-house supply of used cars). Unable to improve on traditional dealer model, all six revert to it. Dealers adapt best practices (e.g. F&I menu selling). Combined market share of the Public 6 in 2004: 8.1%; in 2014: 8.6%.

- Past threat #2: "Rise of the disintermediators" – Original AutoByTel, CarsDirect, et al. Becomes clear the model is flawed, costly. ABTL IPOs at over $200 in 1999, currently trading at $18. Dealers learn to use the internet themselves, these firms become service providers.

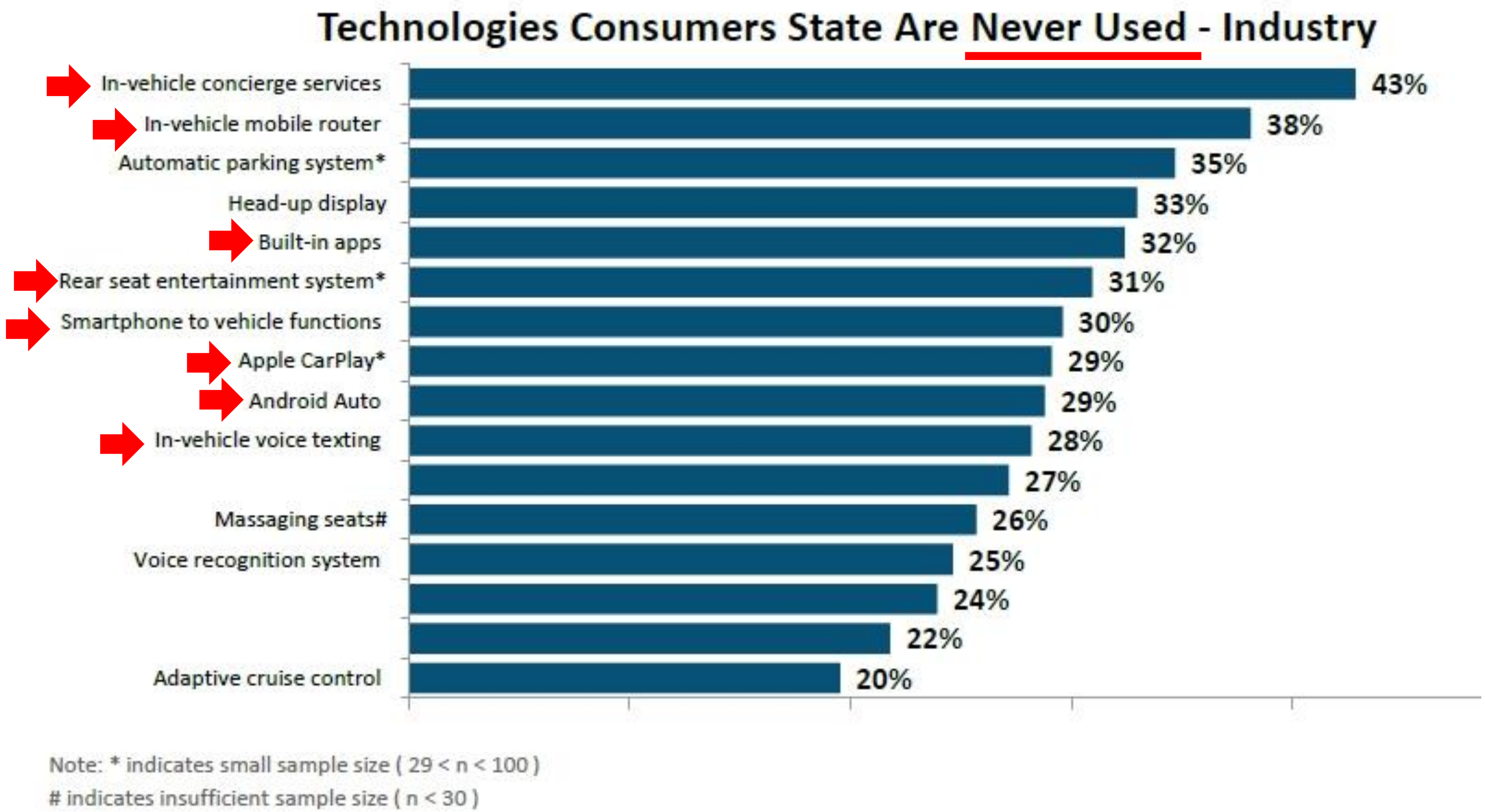
- Past threat #3: "Invasion of the OEMs" – FRN and GMRH. Ford Retail Network gone by 2001, and GMRH cancels before it launches. Dealers simply out-compete company stores.

Implications for dealers: specific

- Connectivity:
  - PRO: more options and features to sell, telematics in theory will boost service retention, connected cars may bring in younger customers…
  - CON: value often unclear, more training required, more time to devote to customer education, potential blowback when things don't work
- Mobility:
  - PRO: not much… maybe higher per-car service as cars are run harder
  - CON: individual retail sales shift to fleet sales (to Uber, Maven) … If cars become commoditized "pods" mix is diluted
- Autonomy:
  - ADAS PRO: more options, safety benefits may pull demand ahead
  - ADAS CON: more training, more OEM liability (passed to dealers?)
  - FULL AUTONOMY: years away but will raise prices (+/-), will raise demand (vs. mass transit, *and from the elderly*), will drive up VMT and service load

CONNECTIVITY: Many of these features are just lost on customers

JD POWER CUSTOMER VALUE IN AUTO TECHNOLOGY SURVEY, 2015



CONNECTIVITY: And many dealers can't afford the time to explain them

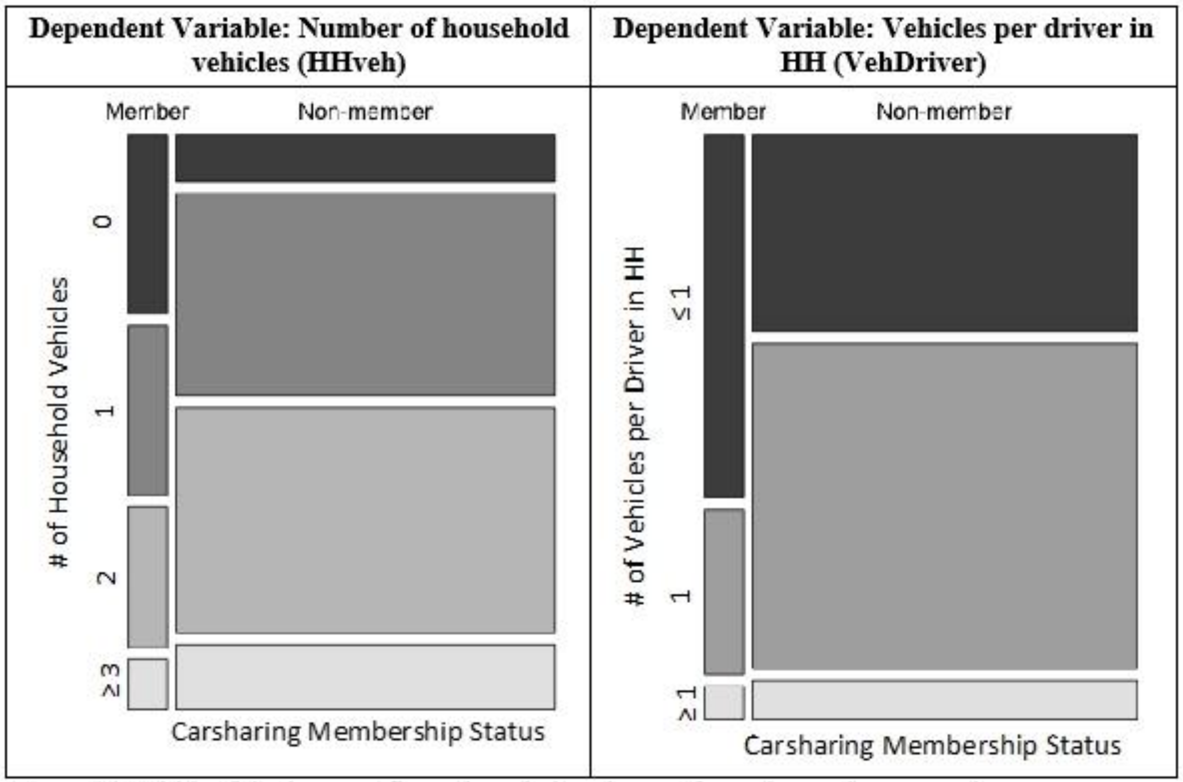
OLIVER WYMAN CAR TECHNOLOGY STUDY 2015

"The dealer remains a primary information source in the sales process. Our report found out that some dealers take 12 minutes to explain innovations… while others ignore them entirely. The average was 5 minutes. Among luxury brands, Mercedes-Benz dealers spent the least time on innovations, Lexus dealers the most. There was little connection between the emphasis that the OEM brand put on innovation and the time that the dealer spent explaining or offering innovations."

► BUT, if the salesperson should spend more time on this, who will pay for her or his time doing so?

MOBILITY: It is clear that rideshare depresses vehicle ownership….

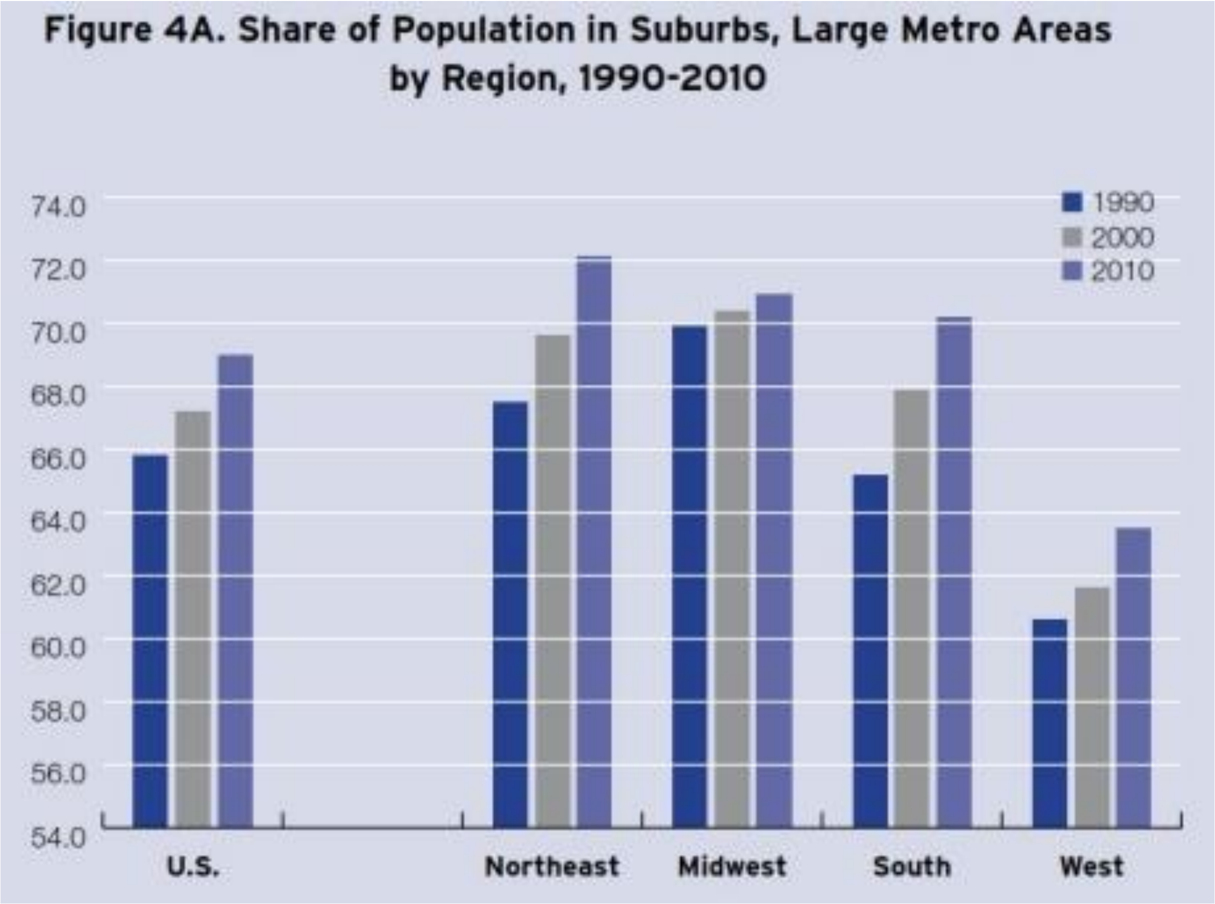
CARSHARE IMPACT ON CAR OWNERSHIP STUDY



Source: "The effect of carsharing on vehicle holdings and travel behavior: A propensity score and causal mediation analysis of the San Francisco Bay Area," G S Mishra, R R Clewlow, P L Mokhtarian, K F Widaman (2015)

MOBILITY: …but how far will rideshare spread?

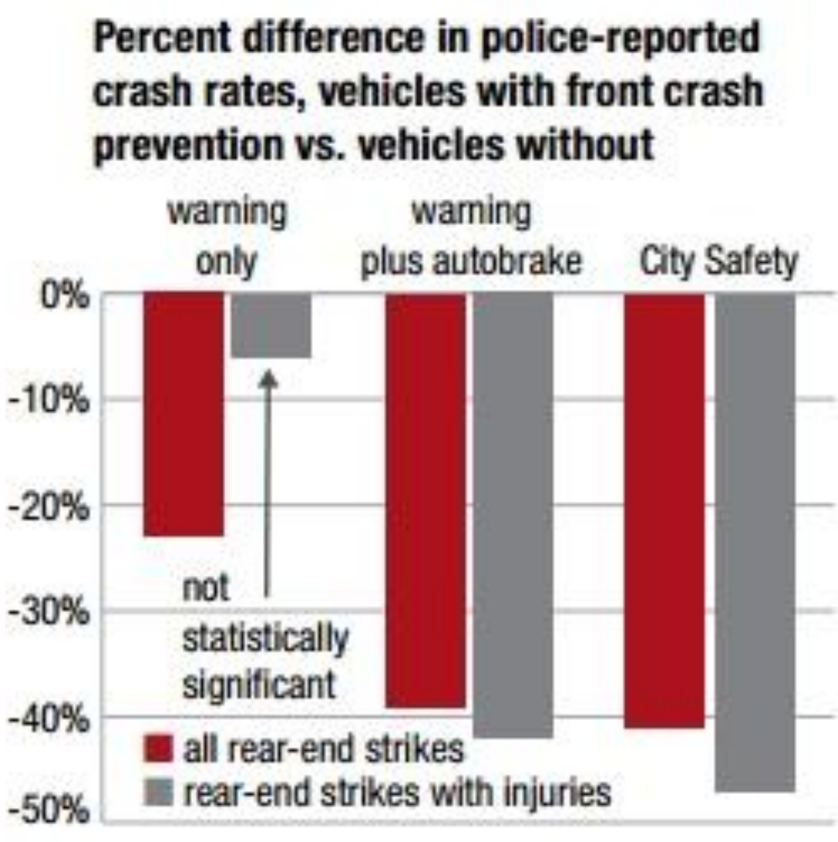
SUBURBS'S SHARE OF USA POPULATION HAS GROWN STEADILY FOR THE LAST 20 YEARS



Source: W Frey, Brookings , 2012]

AUTONOMY: ADAS may pull demand forward, due to safety benefits….

ADAS IS STARTING TO HAVE REAL IMPACT ON COLLISIONS

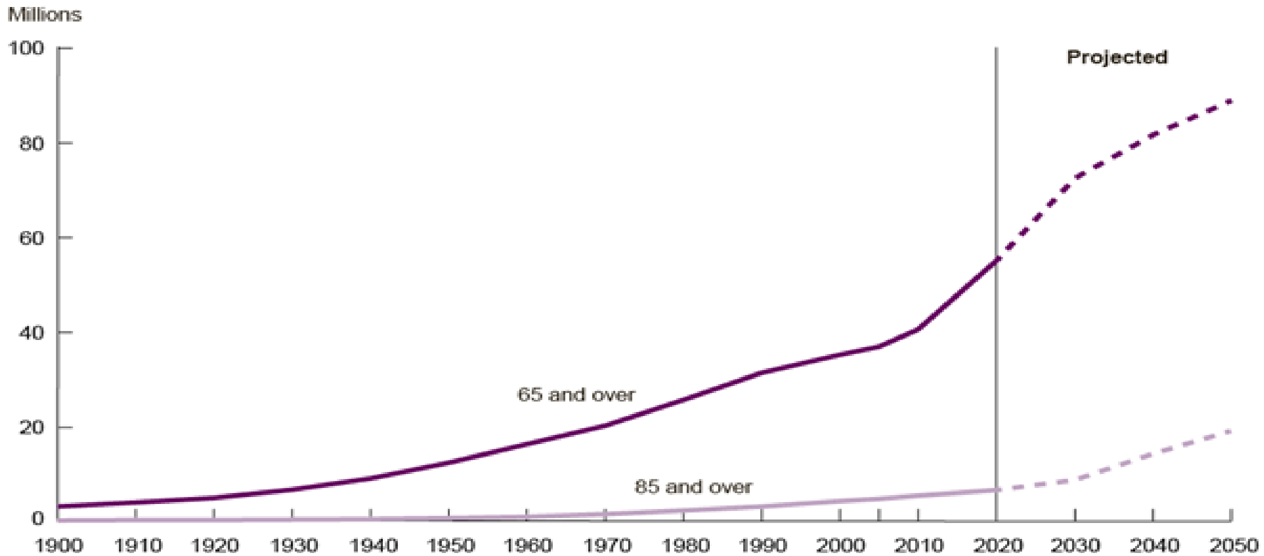


Source: IIHS January 2016; City Safety is Volvo’s system

AUTONOMY: The “killer app” may be mobility for the elderly.

L45 (QUASI) FULL AUTONOMY COULD BE A BOON FOR THE DISABLED OR ELDERLY

Population age 65 and over and age 85 and over, selected years 1900–2010 and projected 2020–2050



NOTE: These projections are based on Census 2000 and are not consistent with the 2010 Census results. Projections based on the 2010 Census will be released in late 2012.

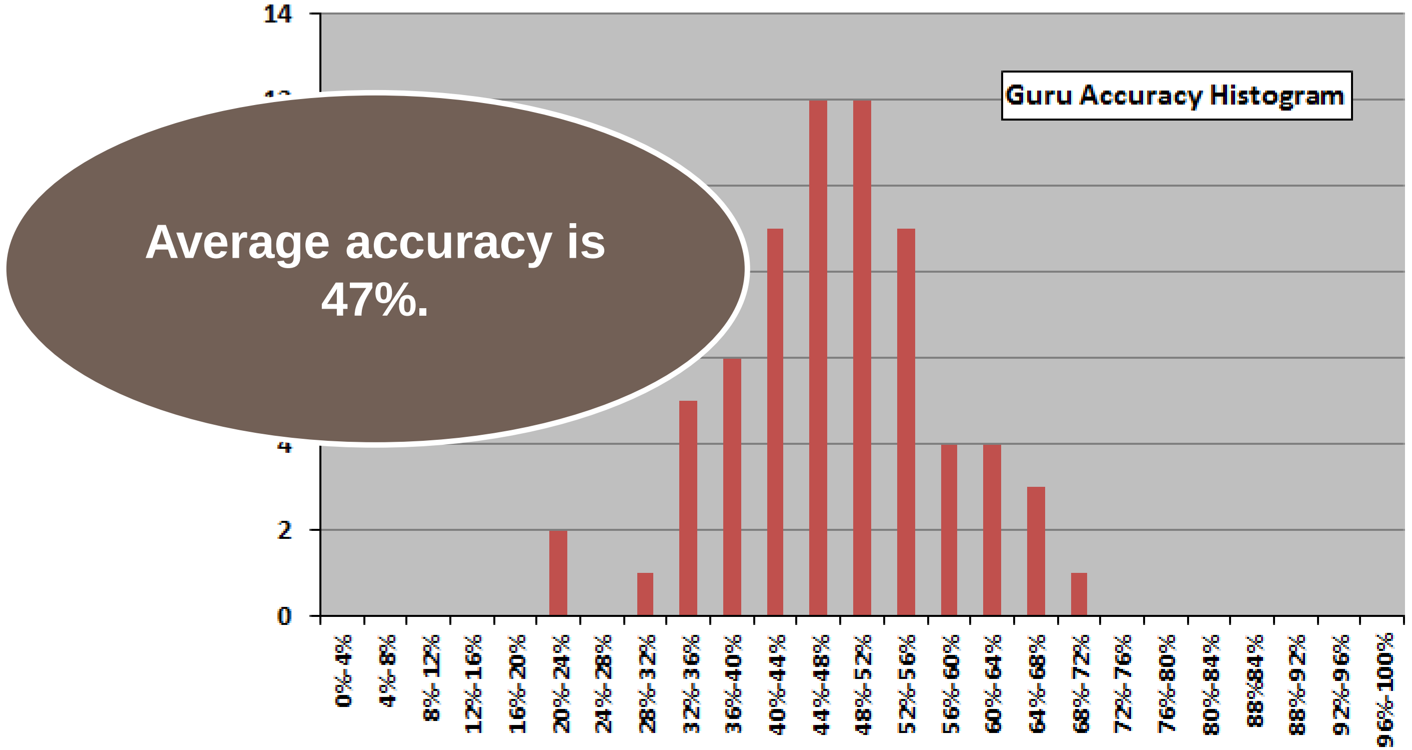
Reference population: These data refer to the resident population.

SOURCE: U.S. Census Bureau, 1900 to 1940, 1970, and 1980, U.S. Census Bureau, 1983, Table 42; 1950, U.S. Census Bureau, 1953, Table 38; 1960, U.S. Census Bureau, 1964, Table 155; 1990, U.S. Census Bureau, 1991, 1990 Summary Table File; 2000, U.S. Census Bureau, 2001, *Census 2000 Summary File 1;* U.S. Census Bureau, Table 1: Intercensal Estimates of the Resident Population by Sex and Age for the U.S.: April 1, 2000 to July 1, 2010 (US-EST00INT-01); U.S. Census Bureau, 2011. *2010 Census Summary File 1;* U.S. Census Bureau, Table 2: Projections of the population by selected age groups and sex for the United States: 2010–2050 (NP2008-t2).

Source: IIHS, Federal Interagency Forum on Aging-Related Statistics

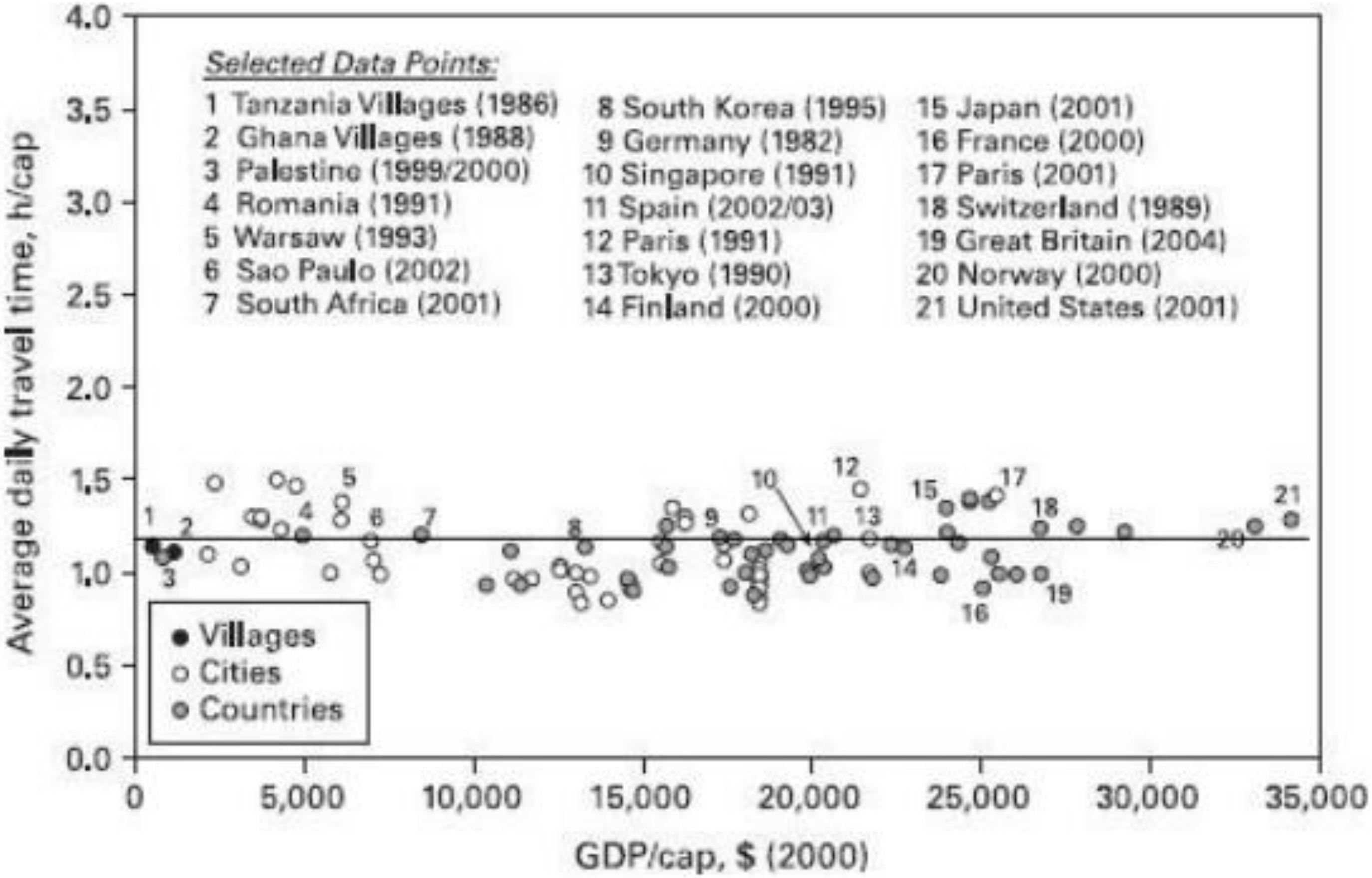
CLOSING COMMENT 1: BEWARE EXPERTS (SUCH AS ME)

6,582 FORECASTS FOR THE US STOCKMARKET 2005-2012, AS OFFERED BY 68 EXPERTS, WITH ACCURACY PEGGED TO THE S&P 500



Source: CXO Advisory

CLOSING COMMENT 2: THE ETERNAL URGE TO MOVE



Average daily travel time in hours per person as a function of GDP per capita. Source: updated dataset of Schäfer, A., D.G. Victor, 2000. The Future Mobility of the World Population, *Transportation Research A*, 34(3): 171-205.

END