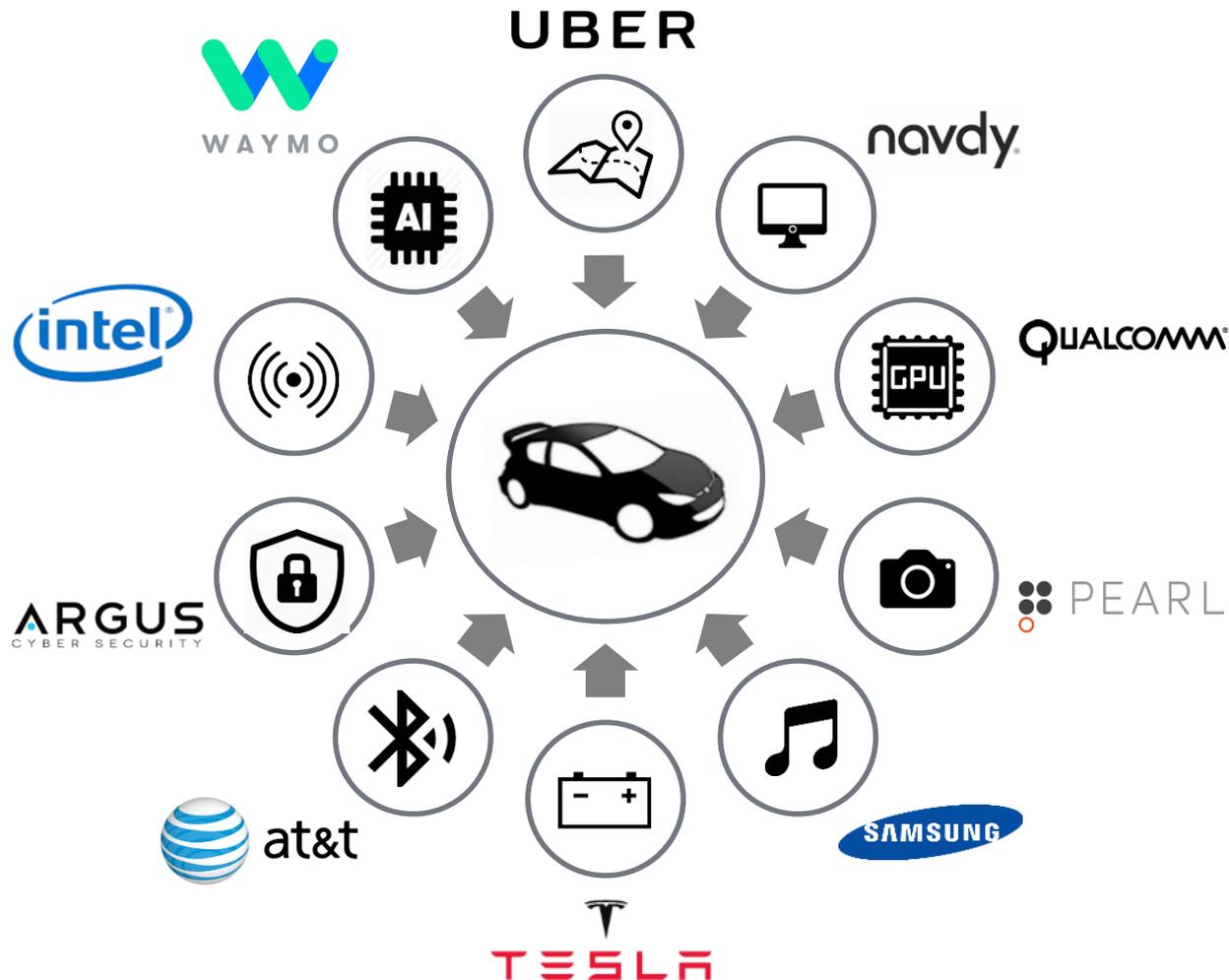


Sherpa Technology Group

Automotive Technology & Strategy Outlook Second Annual Report – May 2017



Disclaimer: the logos above are not sponsored by, authorized by, or associated with Sherpa

www.SherpaTechnologyGroup.com

Email: Automotive@Sherpatg.com

Telephone: (617) 248-0030

About Sherpa Technology Group / Target Audience

About Sherpa Technology Group (STG)

- Founded in 2008, STG (formerly 3LP Advisors) is a strategy and M&A advisor on technology and intellectual property matters based in Silicon Valley and Boston
- Members of our leadership team formerly ran The Boston Consulting Group's IP Strategy Practice and managed leading patent estates for the world's most recognizable companies, such as IBM, Intel, and Intellectual Ventures
- Our clients include Fortune 500 companies, emerging technology companies, investors and investment banks

Target Audience

- STG's second annual report is intended for automotive executives, technology executives, and investors (PE funds, hedge funds, etc.). For last year's report, see: www.sherpatg.com/perspectives

Say goodbye to the “traditional” automotive industry

Auto and tech are converging

- 1 Tech companies have deep pockets and will be disruptive; Silicon Valley thinks differently than the auto industry

Disruption of the auto business model

- 2 The car is becoming both a multi-functional device and service platform; this happened in the smartphone industry 10 years ago, and many incumbents fell (e.g. Nokia, RIM)

Disruptors are benefiting from the evolving automotive value and supply chains

- 3 Tier 1 and 2 suppliers own significant design and manufacturing capabilities, enabling disruptors to more freely enter the field; this is leading to new market dynamics and profit pools

The auto industry in China is booming, but...

- 4 Chinese autos looking to expand internationally into profitable markets will need to have the appropriate technology rights and strategies

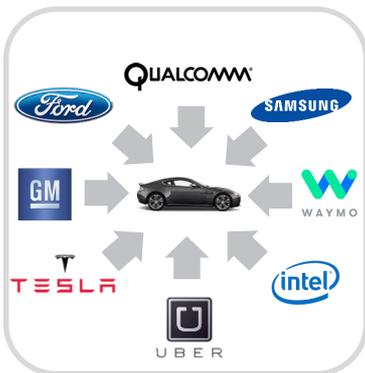
Highlights from the document

Part 1: the auto and tech industries are converging

Industry trend

1

The auto and tech industries are converging



Observations

- History is repeating itself: Silicon Valley took over computing and communications, and auto is next (p. 10)
- Tech companies think differently; they hire, invest, compensate, value businesses, and ultimately make money in different ways (pp. 11-12)
- Auto incumbents have relatively low TEVs; tech entrants, using their cash alone, could buy most of the auto industry and have shown a willingness to make big acquisitions (pp. 13-14)
- Tech entrants are investing in technology chokepoints (e.g. AI, 5G, batteries, cybersecurity, etc.), while auto incumbents are betting on companies that are tech-lite (e.g. components suppliers, ride-hailing apps) (pp. 15-19)
- Companies with fundamental tech rights will endure; just look at how Qualcomm and Microsoft profited from smartphones (pp. 20-23)

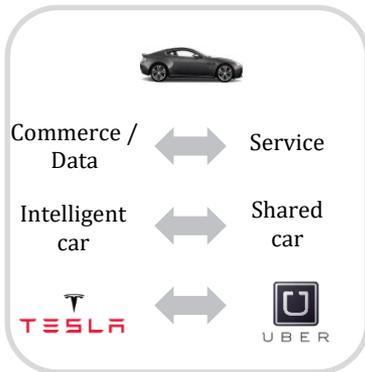
Highlights from the document

Part 2: disruption of the auto business model

Industry trend

2

Disruption of the auto business model



Observations

- Two significant business models are emerging: 1) the car as a device (i.e. commerce and data platform) and 2) the car as a service (p. 27)
- Tech companies are experts at owning platforms and services; auto incumbents need to start thinking like tech companies if they want to compete in the new game (pp. 29-37)
- Auto incumbents need to pay attention to history where similar business model disruption occurred: communications (Apple and Google), cloud computing (Amazon), software (Salesforce), video rental (Netflix), and music distribution (Spotify) (pp. 40-43)
- Car sharing services are on the rise, and the demand for personal cars could level-off and decline; tech companies need to profit from the “sharing” economy (pp. 44-59)

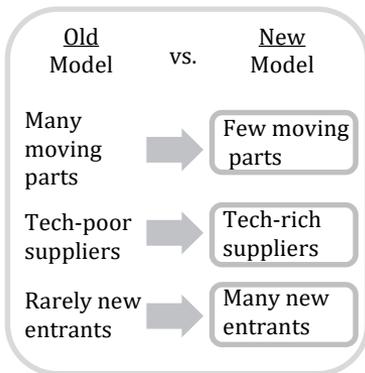
Highlights from the document

Part 3: Disruptors are benefiting from the evolving value and supply chains

Industry trend

3

Disruptors are benefiting from the evolving value and supply chains



Observations

- Electric vehicles have fewer moving parts than internal combustion engine vehicles; this means less complicated supply chains and lower barriers to entry for new entrants (pp. 63-72)
- Emerging OEMs like Tesla lack technology rights, which makes them vulnerable (pp. 73-74)
- Auto incumbents need to consider IP strategies to deal with disruptive tech companies, which are already adept at using IP to their advantage (p. 75)
- Emerging autos need to think about how to own their roadmaps and protect margins, as they are faced with new suppliers (e.g. Samsung / Harman) (p. 77)

Highlights from the document

Part 4: China is booming, but Chinese autos are geographically restricted

Industry trend

Observations

4

**China is booming,
but Chinese autos
are geographically
restricted**



Auto Market vs. Technology Rights



- China produced more cars in 2016 than the US and Germany combined, and its rate of production increased more than any other country (pp. 79-80)
- However, Chinese autos lack technology rights and related strategies to expand into international markets (pp. 81-85)
 - When faced with a similar problem, Chinese and Korean smartphone manufacturers started buying patents in other countries
- Meanwhile, non-Chinese autos need to consider an IP strategy in China, where the patent enforcement environment is getting stronger (pp. 86-88)
- There are additional strategies for reshaping the ecosystem, getting lower cost of goods sold, and developing useful partnerships (pp. 89-93)
 - E.g., consider acquiring technology from orthogonal industries (e.g. aerospace and defense) and other Asian geographies (e.g. Japan, Vietnam, etc.)

Recommendations for the industry

Industry trends

What to do about it

1

The auto and tech industries are converging

- Auto incumbents: “look at where the puck is going, not where it’s been”; move fast and acquire the right tech; consider non-obvious sources (e.g. Boeing has auto IP); invest in standards bodies in key tech areas (e.g. LiDAR)
- Tech entrants: Leverage your larger war chests to make acquisitions around key technologies; make sure you control the right IP chokepoints (e.g. computer vision, robotics, AI)

2

The traditional automotive business model is disappearing

- All automotive players: the auto business model will be about managing commerce / data platforms and services; identify the profit pools that you seek to own and make sure that you have the appropriate technology and strategy

3

Disruptors are benefiting from the evolving value and supply chains

- Auto incumbents: acquire and file patents on key feature differentiators for your brand; leverage suppliers to maintain the lowest cost of goods sold
- Suppliers: use tech position to ensure ubiquitous adoption of your technologies
- Tech companies: keep doing what you’re doing; build up your supply chains in auto with appropriate IP

4

China is booming, but Chinese autos are geographically restricted

- Chinese autos: Acquire technology rights and enter cross licenses to enable international expansion without friction; invest in and establish standards bodies
- Auto incumbents: Leverage your significantly larger patent portfolios to cut favorable deals with patent-poor Chinese autos, raise their technology costs, or shut them out of the market

Part 1: Auto and tech are converging

Auto and tech are converging

- 1 Tech companies have deep pockets and will be disruptive; Silicon Valley thinks differently than the auto industry

Disruption of the auto business model

- 2 The car is becoming both a multi-functional device and service platform; this happened in the smartphone industry 10 years ago, and many incumbents fell (e.g. Nokia, RIM)

Disruptors are benefiting from the evolving automotive value and supply chains

- 3 Tier 1 and 2 suppliers own significant design and manufacturing capabilities, enabling disruptors to more freely enter the field; this is leading to new market dynamics and profit pools

The auto industry in China is booming, but...

- 4 Chinese autos looking to expand internationally into profitable markets will need to have the appropriate technology rights and strategies

Auto industry, meet Silicon Valley

Automotive incumbents

Automotive manufacturers



Automotive suppliers



New entrants / disrupters

Tech companies



Semiconductor companies



Electric vehicle companies



Ride sharing companies



Note: exemplary companies shown; not comprehensive
 [Red box] Denotes recent company acquisition or major stock purchase

Silicon Valley “thinks different”

	Auto Industry Auto OEMs / suppliers	Silicon Valley Tech companies
Culture	Formal; stereotypically “old school” work environment	Less formal; free food; “bring your dog to work”
Comp packages ¹	Salary + profit sharing <ul style="list-style-type: none"> ▪ Cost cutting / profit-based incentives ▪ Software engineer (GM) = \$75k salary 	Salary + stock options (heavily weighted) <ul style="list-style-type: none"> ▪ Growth-based incentives ▪ Software engineer (Google) = \$126k salary
Valuation multiple ²	Avg. P/E multiple: <u>10.8x</u>	Avg. P/E multiple: <u>22.6x</u> (over double)
Technology development	Tend to focus mostly on car-related technologies	Broad focus: big data, apps, ecommerce, communications, sensors and navigation, etc.
Business models	Make money from selling cars / parts	Unbounded; make money from everything (e.g. data)
IP Strategy	Auto “plays nice” with cross licenses	Sophisticated use of IP to shape ecosystem, uses standards bodies, etc.

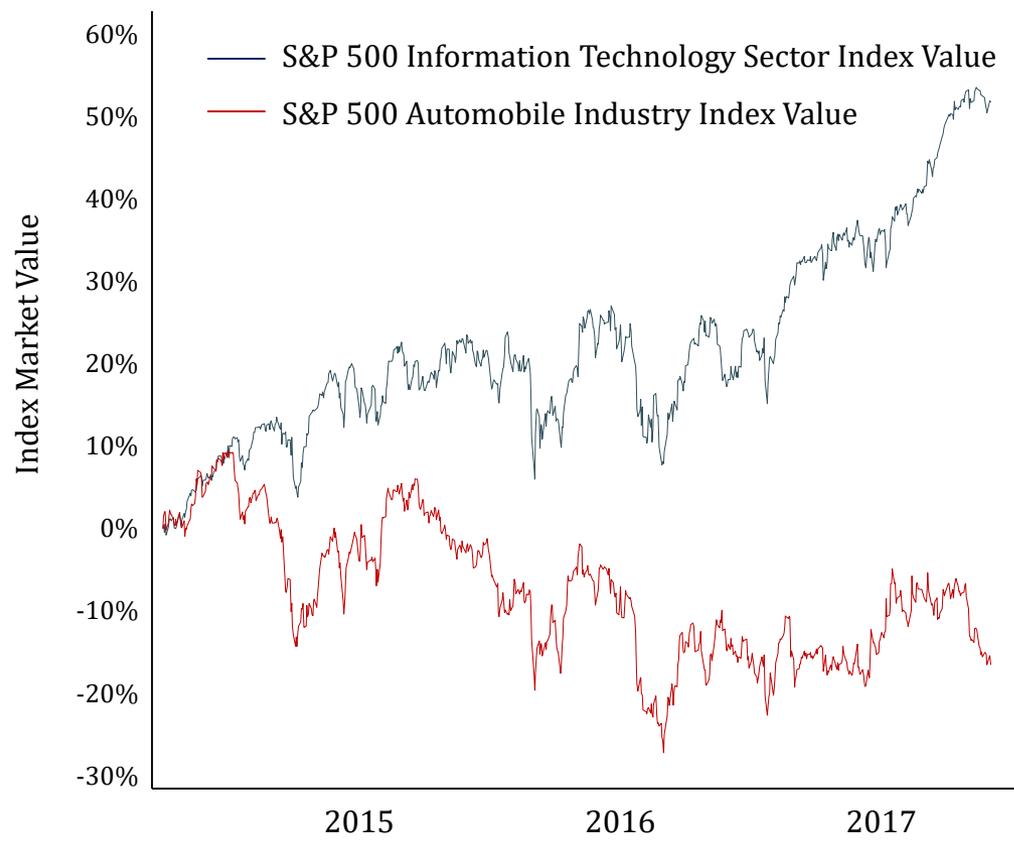
Car companies will have no choice but to adapt, and that means more proactive IP strategies; otherwise, tech entrants will act first with their IP

¹Glassdoor salary data for software engineers

²Capital IQ industry data for “Automobile manufacturers” (including GM, Ford) and “information technology” (including Google, Apple), as of 4/18/17

Tech companies are promising Wall Street growth, while autos are focused on cost cutting

Automobile vs. Technology Index Performance (Past 3 Years)



Tech Companies

Experiencing massive market value growth

High P/E multiples enable tech cos. to raise money quickly and make acquisitions

CEOs are heavily incentivized to scale their businesses



Automotive Companies

Losing market value YoY

P/E ratio reflects a commodity business

CEOs are incentivized to cut costs and improve margins

Source: Capital IQ industry index data, as of 4/18/2017
Exemplary companies in IT index (Google, Apple); exemplary companies in Auto index (GM, Ford)

Auto incumbents watch out: tech companies can afford to finance disruption

	Top 20 Autos (by TEV)	Top 20 Tech Cos.* (by Cash Balance)	
Total Enterprise Value	\$1.7T	<u>\$4.8T</u>	Technology companies are bigger than autos
EBITDA	\$280B	<u>\$370B</u>	Technology companies generate more profits
Cash and ST Investments	\$184B	<u>\$894B</u>	Technology companies have more cash on hand for acquisitions

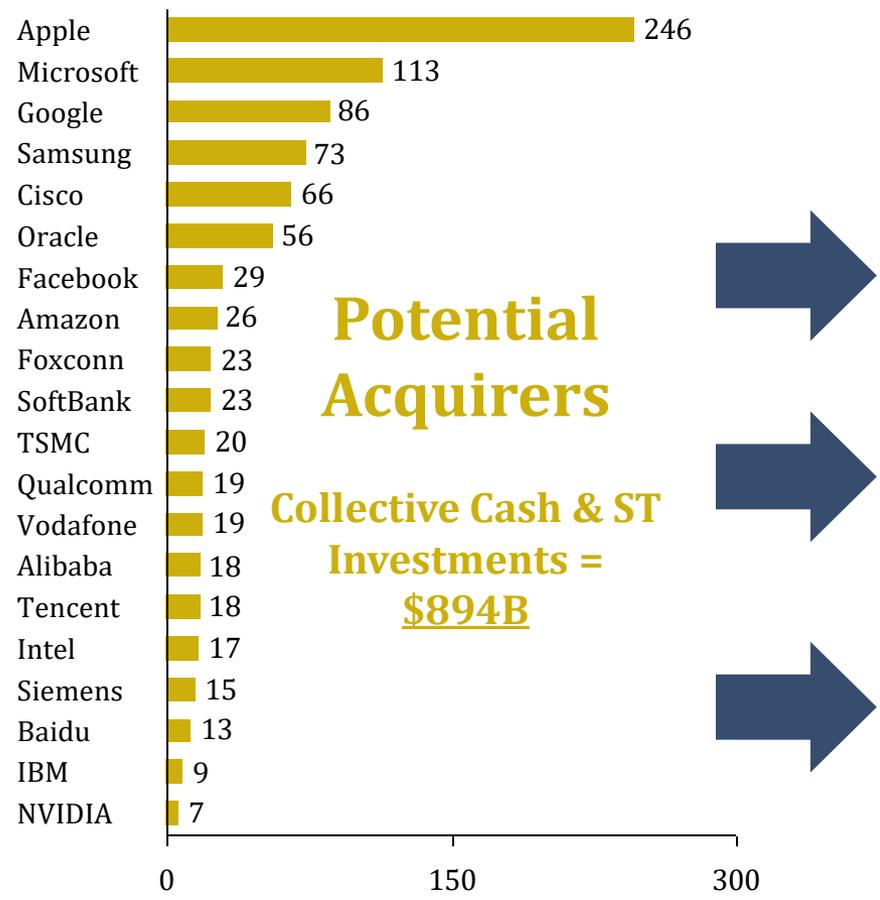
The tech industry is accustomed to using their large cash reserves to make disruptive acquisitions

Source: CapIQ industry screens

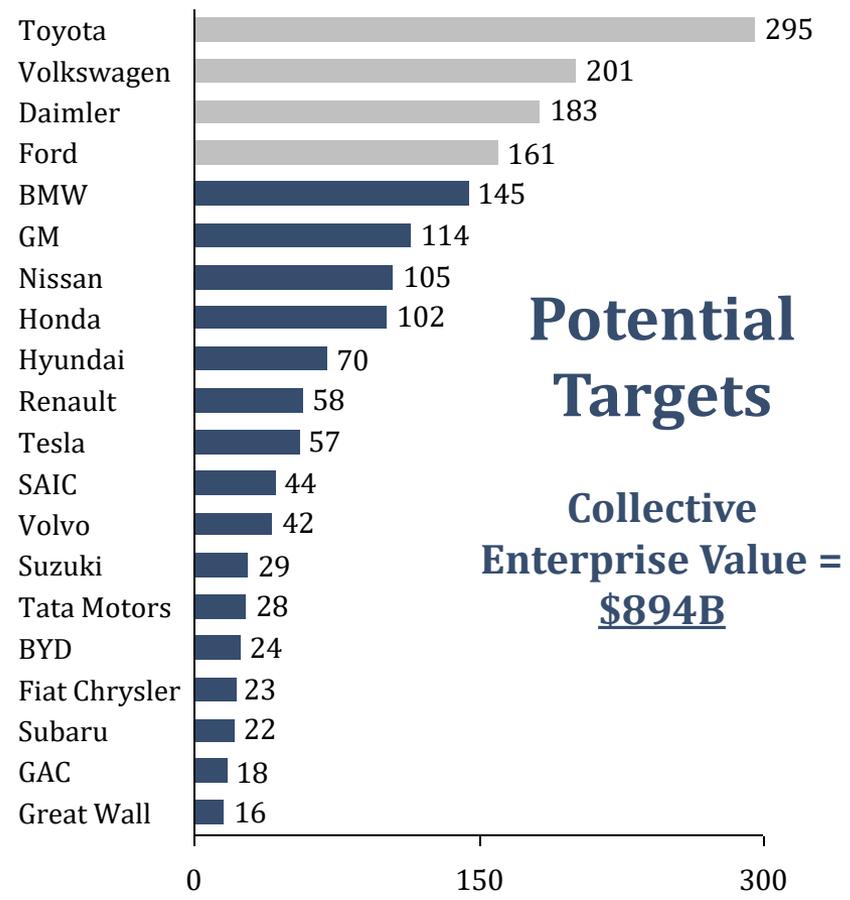
*Includes software, technology hardware, and semiconductor companies and excludes select cos. due to non-affiliation with auto

In fact, the tech industry could buy most of the auto industry using cash alone

Cash & ST Investments of Richest Tech Cos.
(in billions USD)



Total Enterprise Values of Largest Autos
(in billions USD)



Note: totals may not sum due to rounding
Sources: CapIQ data, as of 4/12/17;
<http://money.cnn.com/2017/02/01/investing/apple-cash-overseas/>

Tech companies are making massive moves into auto

Recent Auto Acquisitions by Tech Entrants Valued at \$1B+

Date	Acquirer(s)	Target	Price (\$M)	Topic
▶ Oct-16	Qualcomm	NXP	\$47,000	Automotive semiconductors
▶ Mar-16	Intel	MobilEye	\$15,300	Sensors / autonomous driving
▶ Nov-16	Samsung	Harman	\$8,000	Connected car
▶ Sep-15	Qualcomm	CSR	\$2,200	Automotive software
Mar-16	Tencent	Tesla*	\$1,700	OEM
▶ Aug-17	Didi	Uber China	\$1,000	Ride-hailing
▶ May-16	Apple	Didi	\$1,000	Ride-hailing

Total spend on mega (\$1B+) deals

\$76,200M

Qualcomm, Intel, and Samsung have spent more than \$70B in auto tech acquisitions alone... auto incumbents, it's time to wake up

*Denotes a minority stake interest

Source: CapIQ screens, PWC data, and selected press releases

Denotes acquisition of auto tech co.

Meanwhile, what are the incumbents doing?

Recent Acquisitions by Auto Incumbents Valued at \$1B+

Date	Acquirer(s)	Target	Price (\$M)	Topic
Aug-16	Toyota	Daihatsu Motor	\$3,132	Internal combustion engines
Jan-16	Magna	Getrag	\$2,666	Transmissions
Oct-16	Nissan	Mitsubishi	\$2,189	OEM
May-16	Trelleborg	CGS	\$1,249	Tires
Dec-16	Daimler	Athlon Car Lease	\$1,221	Traditional car leasing
Jul-16	Yokohama Rubber	Alliance Tire	\$1,179	Tires
Mar-16	LKQ	Rhino	\$1,135	Spare parts
Aug-16	Punch Powertrain	Yinyi	\$1,110	Powertrain
▶ Feb-17	Ford	Argo AI	\$1,000	Autonomous driving

Total spend on mega (\$1B+) deals

\$14,881M

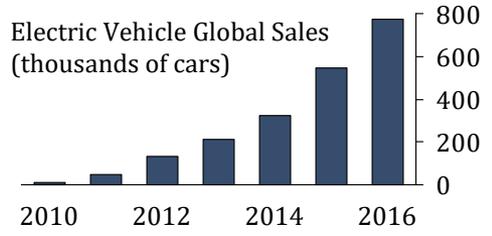
Rarely are incumbents making sizeable (\$1B+) investments in auto tech companies... most incumbents are sticking to old M&A strategies

Incumbents and new entrants are squaring off on many technology fronts

Automotive technology area

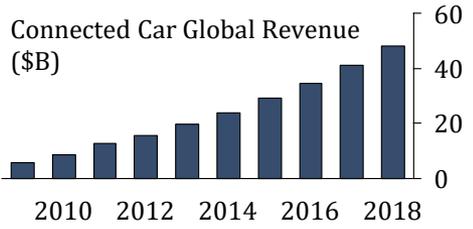
Example "core" technologies

The Connected Car:
The car as a wireless device, computer, and entertainment system



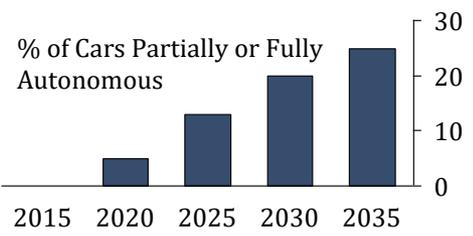
- 5G communications
- Cybersecurity
- Car/mobile phone interfaces
- In-car Wi-Fi and internet standards
- Smart home integration (i.e. Ford and Amazon's Alexa)

The Electric car:
The car that is powered electrically



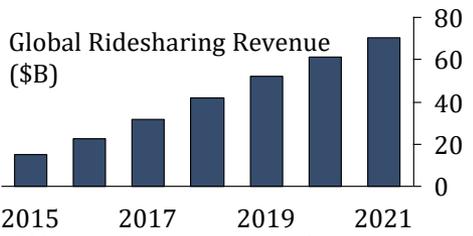
- Lithium and graphene batteries
- Universal charging stations
- Battery/charger interfaces, communicating with charging station
- Battery communication with connected car

The Self-Driving Car:
The car that drives autonomously



- Artificial intelligence
- Autonomous vehicles communicating with each other (V2V)
- Communicating with outside entities / infrastructure (V2I)
- LiDAR, computer vision, etc.
- Semiconductors (GPUs)

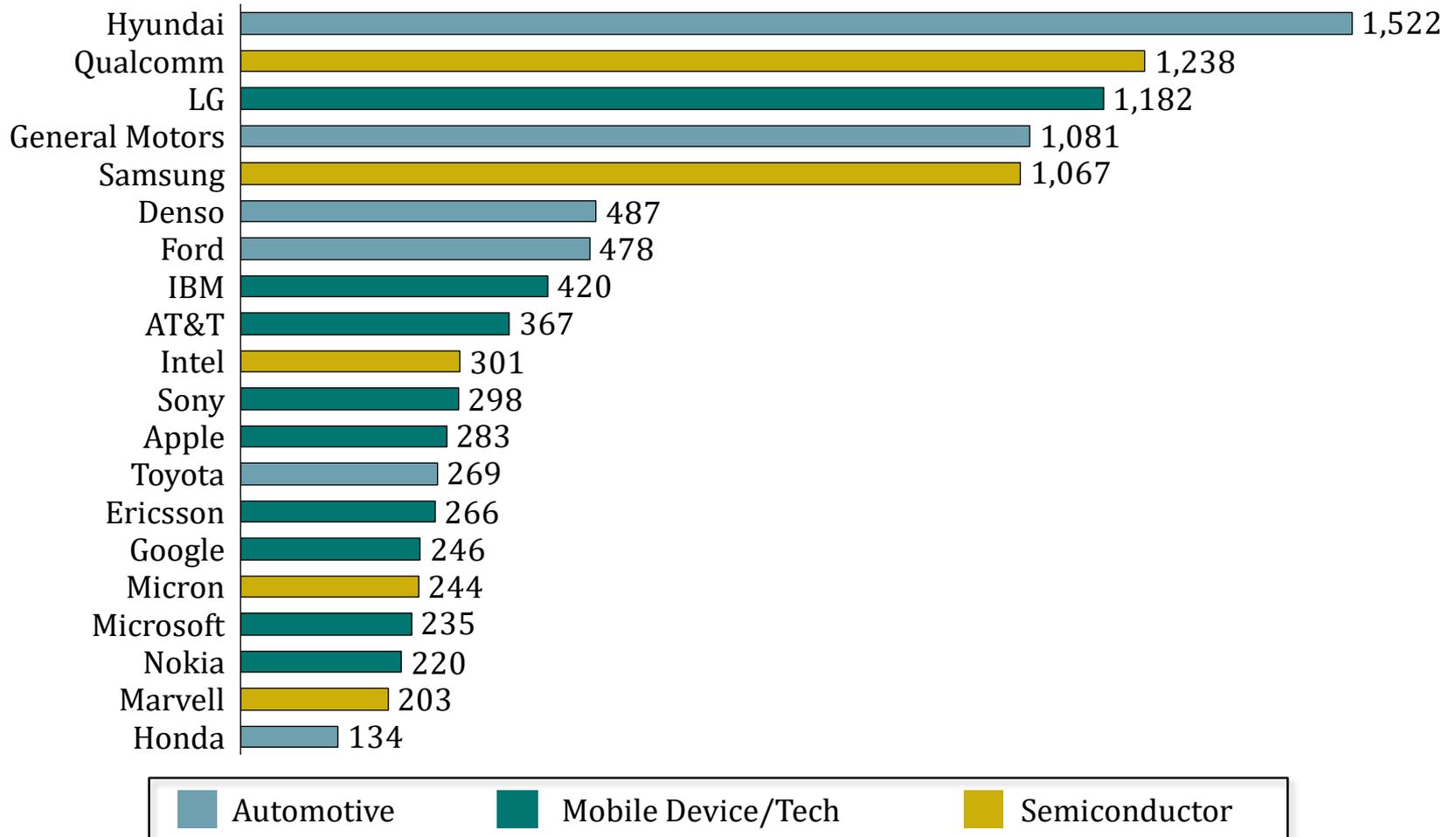
The Shared Car:
The car as a service



- Car-as-service universal interface with mobile phone/smart home
- Map and navigational standards across cars used for ride-sharing
- Combination with autonomous vehicles

Example: the connected car space is seeing patenting from the auto, semiconductor, and mobile device industries

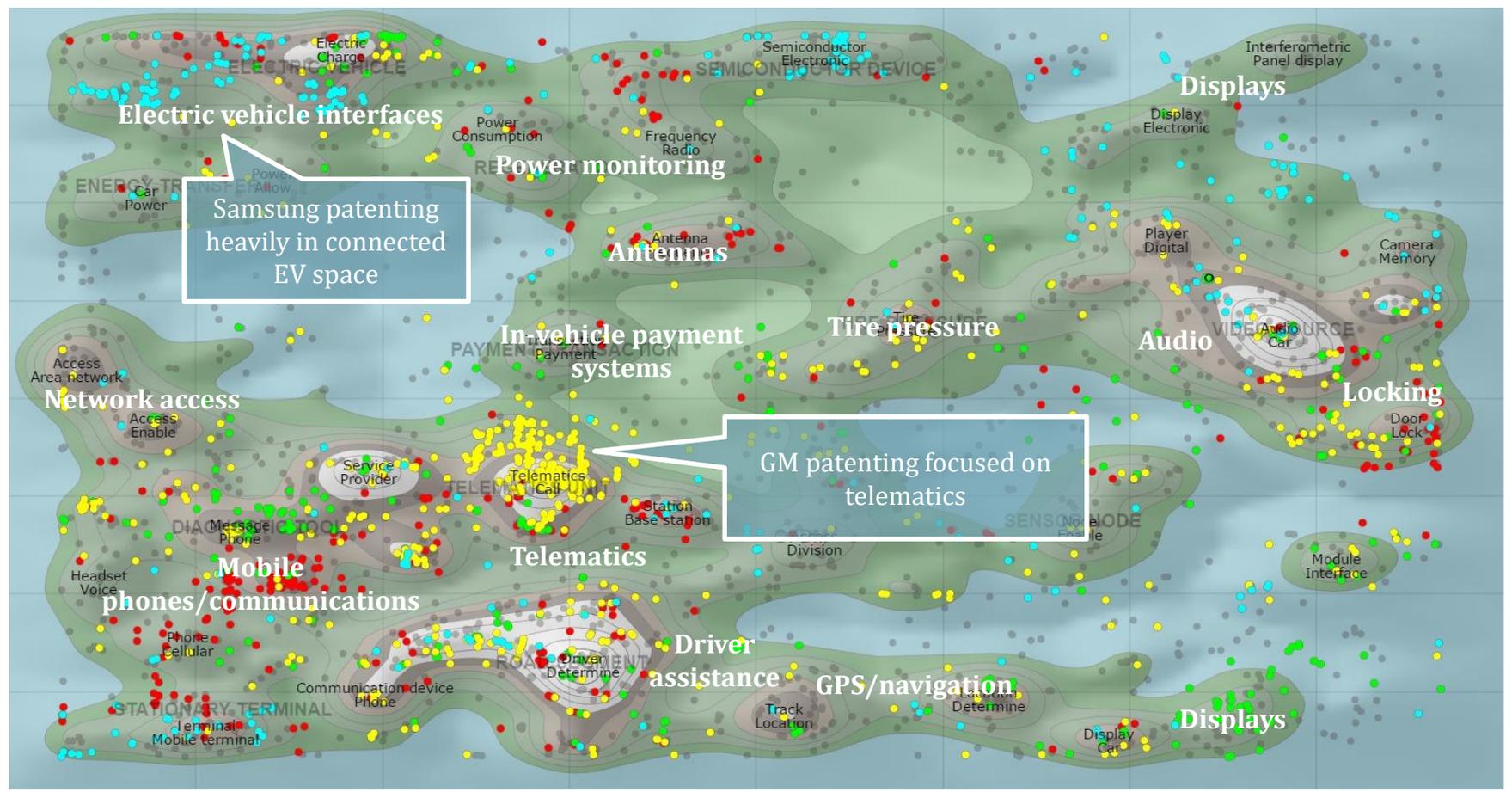
Connected Car Patent Holdings (JP, US, CN, KR, EP grants and applications)



Search using Thomson Innovation: Title/Abstract/Claims contains: (wifi OR wireless OR bluetooth) AND (car OR vehicle OR automobile), priority year 1997 or later. US, EP, KR, CN, JP apps and grants. Returned 44,347 distinct application numbers. Exemplary companies shown above

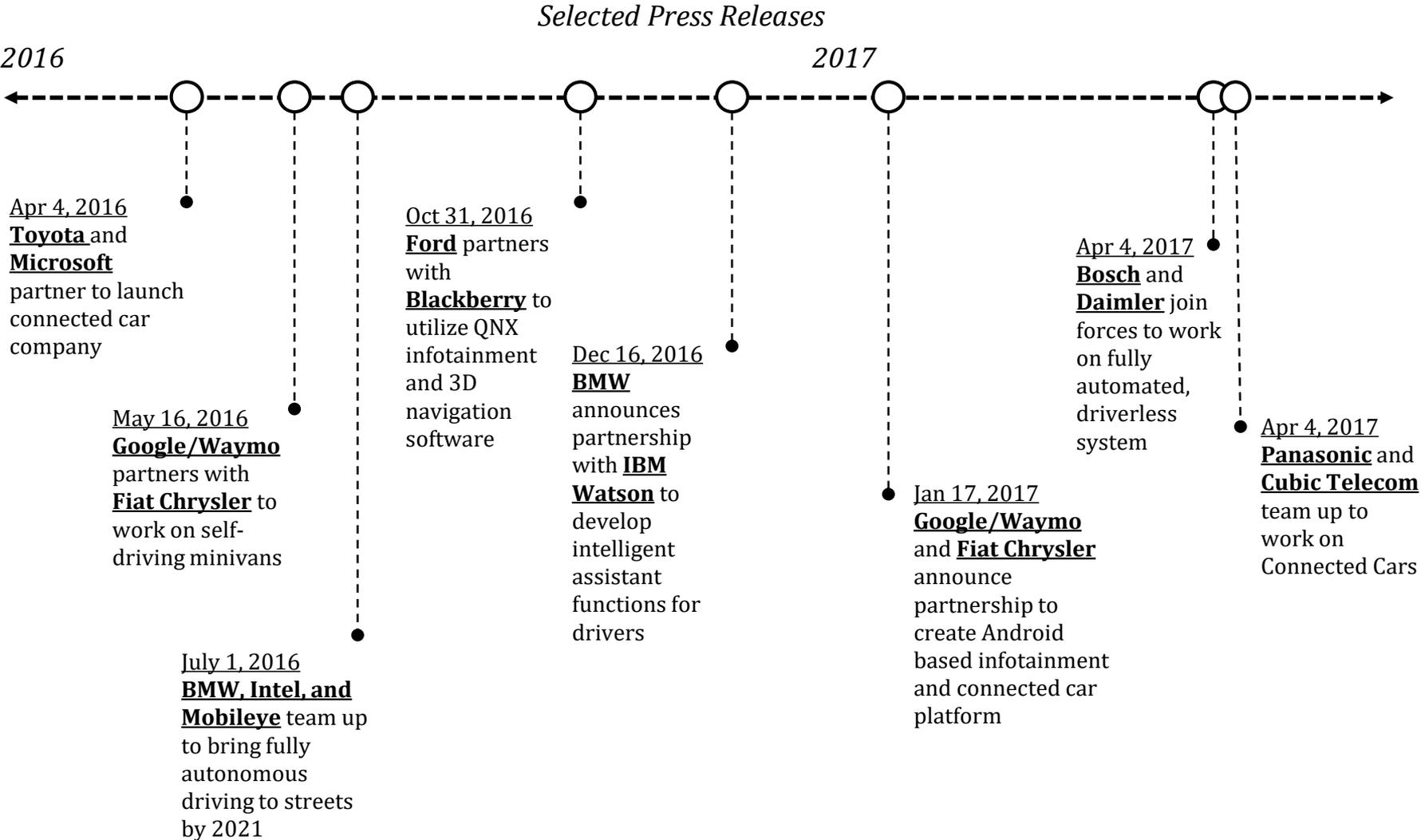
Players from each industry are trying to carve out their own technology positions

● Denso ● Ford ● GM ● Samsung



Thomson Innovation "Themescape" map above (originally developed by STG founding partner, Kevin Rivette) clusters patents by the similarity of words in the patents. Mounds represent high concentrations of patents. Colored dots represent patents held by the companies specified above. The patents represented include documents related to connected car, using the search described on the previous slide.

Incumbents are working with new entrants and forming partnerships, but they need to make sure they own the tech rights



Incumbents have been “playing nice” so far... but smartphone makers tried that too and it failed

Company

Collaborative Approaches/Sentiments

Automotive companies from 2014-17



Toyota: 5,680 fuel cell patents made available for royalty-free use until 2020 (2015). Toyota joined the Open Innovation Network (OIN), which encourages and protects the development of open-source software (2016).

Ford: Opens portfolio of electrified vehicle technology patents (2015). Forms SmartDeviceLink with Toyota to help developers build in-car apps (2016).

GM: “We view cybersecurity not as area for competitive advantage, but as a systemic concern...best served by industry-wide collaboration and the sharing of best practices.” -Mary Barra, CEO of GM (2016)

Daimler: Join Automotive Grade Linux (AGL), a collaborative open source project developing a Linux-based, open platform for the connected car (2017).

Hyundai: “At Hyundai, we’re quite open with our assets – that is, we are willing to license a patent based on needs with a competitor, provided it can help our industry as well as our customers.” -Seung Cheol Lim, IP planning and strategy, Hyundai Motor Company (2015)

Tesla: “[We] will not initiate patent lawsuits against anyone who, in good faith, wants to use our technology.” (2014)

Mobile device leaders in 2006



Nokia: “Harri Mannisto, Director, Multimedia Experiences at Nokia, noted that commercial mobile TV services were on the verge of launching in several markets across the world. ‘In order for mobile TV to be a true success, we need interoperable mobile devices and systems which deliver the best experience for consumers.’” (2006)

Motorola: “Operators around the world are evaluating broadcast mobile TV as a compelling new service to offer their subscribers -- and interoperability will play a key role in bringing these services to market faster,” said Rob Bero, director of broadcast technologies, Motorola.” (2006)

Sources:

Select quotations from Intellectual Asset Magazine, “In the driving seat”, September/October 2015; <http://newsroom.toyota.co.jp/en/detail/4663648>; <http://www.forbes.com/sites/briansolomon/2014/06/12/tesla-goes-open-source-elon-musk-releases-patents-to-good-faith-use/#4a05432f18e4>; <http://company.nokia.com/en/news/press-releases/2006/09/11/motorola-and-nokia-to-cooperate-on-mobile-tv-interoperability>; <https://theycyberwire.com/events/billington-gacs-2016-gm-ceo-mary-barra-keynote.html#sthash.VflieTM1.dpuf>

Remember, Qualcomm and Microsoft made billions from having fundamental tech rights during the smartphone wars



- Rose to industry leadership quickly – now among the perennial semiconductor giants like Intel
- Succeeded in large part due to its targeted and strategic use of patents, which it skillfully licensed to the mobile device ecosystem
- **Generated \$51B in patent licensing revenue** since 2006, of which \$44B is profit

- Has made leveraging its IP portfolio a strategic priority – more so than many other tech companies
- Made strategic patent acquisitions to augment its war chest of assets
- **Generated \$3.4B in Android patent licensing** in 2013; more than \$1B of which was reportedly paid by Samsung for its sales of mobile devices

Who will strategically use their patents in the new, high-tech automotive world?

Prediction: as new profit pools emerge, expect tech battles

Companies in Dispute (Examples)	Date of Initial Complaint	Description of Patent Dispute
 v. 	Feb 2017	<p>Waymo is suing Otto and parent company Uber for patent infringement and alleged theft of trade secrets by former employee and Otto founder, Anthony Levandowski. Waymo asserts that Levandowski downloaded more than 14,000 files, 9.7 GB of data, that included proprietary LiDAR circuit board designs shortly before resigning and then proceeded to conceal his activities.</p>
 v. 	Feb 2017	<p>Paice has filed a complaint with the ITC against Ford for alleged patent infringement of Paice's hybrid technologies. Paice has requested an investigation and possible ban of importation of Ford's infringing vehicles that are manufactured in Mexico. Paice previously filed a patent infringement lawsuit against Ford in 2014 which was ruled invalid and rejected in two appeals courts.</p>
 v. 	Jan 2017	<p>Quanergy seeks to resolve a dispute about their M8-1 LiDAR Sensor. Velodyne LiDAR has claimed that the M8-1 Sensor infringes upon their U.S. Patent No. 7,969,558 entitled "High Definition LIDAR System." Quanergy seeks to pre-empt a suit by Velodyne by having the court declare that they have not and do not infringe any valid and enforceable claim of the '558 patent.</p>
 v. 	Oct 2016	<p>West View Research (WVR) is suing BMW for damages related to the infringement of two patents titled "Portable Computerized Wireless Apparatus" and "Computerized Information and Display Apparatus." WVR asserts that BMW knowingly infringes upon these patents with an infotainment system used broadly throughout their line of vehicles. WVR has an ongoing suit with BMW filed in November of 2014.</p>
 v. 	Nov 2016	<p>Microchip is seeking damages from the alleged infringement of three of their patents related to vehicle USB connectivity. The Delphi hub allegedly serves the multi-hosting purpose that Microchip's patents detail. Microchip seeks appropriate compensation for the damages sustained and any ongoing infringement post verdict.</p>

As an incumbent auto, what's my next move?

Call to action

- Technologies that were historically central to the computer and consumer electronics industries are now being integrated into cars
- Don't assume that new market entrants can't eat away at your market share
- Patent wars are inevitable – don't bury your head in sand
- The time to act is now – before new entrants gain momentum – and you can be like Qualcomm and Microsoft which have generated billions in royalties from smartphone players



Action agenda

- “Look at where the puck is going, not where it's been” ...Move fast and acquire the right IP in the right places
- Look to non-traditional tech from non-obvious players (e.g. Boeing – AI, Navy – robotics)
- Invest in standards bodies in key tech areas outside of traditional auto (e.g. LiDAR, cybersecurity, etc.)

As a tech entrant, what's my next move?

Call to action

- Apple and Blackberry/RIM have demonstrated that it's possible to take an industry by storm
- But the incumbent auto companies have established supply chains and large patent war chests
- Don't assume that they won't use their IP to disrupt your business and attempt to keep you out of the market



Action agenda

- Make sure you're aggressively filing patents in key chokepoint areas (e.g. computer vision, robotics, AI)
 - The technologies that you file on need to be thought through carefully and cover technology required for incumbents to thrive
 - Your filings need to be in the appropriate jurisdictions around the world
- Use your large war chests to acquire technology companies and substantial patent portfolios
 - It's going to be hard to level the playing field just by filing your own patents, so you should be proactively buying assets and companies

Part 2: Disruption of the auto business model

Auto and tech are converging

- 1 Tech companies have deep pockets and will be disruptive; Silicon Valley thinks differently than the auto industry

Disruption of the auto business model

- 2 The car is becoming both a multi-functional device and service platform; this happened in the smartphone industry 10 years ago, and many incumbents fell (e.g. Nokia, RIM)

Disruptors are benefiting from the evolving automotive value and supply chains

- 3 Tier 1 and 2 suppliers own significant design and manufacturing capabilities, enabling disruptors to more freely enter the field; this is leading to new market dynamics and profit pools

The auto industry in China is booming, but...

- 4 Chinese autos looking to expand internationally into profitable markets will need to have the appropriate technology rights and strategies

The car is becoming both an intelligent device and shared service

	The car as a device	<i>Bridging concepts</i>	The car as a service
<i>Guiding philosophy</i>	The car is a multi-functional, intelligent device that serves as a commerce and data platform	← The car is both a device and service →	The car is for use “as you need it”; the days of mass personal car ownership are ending
<i>Trends</i>	“The connected car” “The electric car”	← “The self-driving car” →	“The shared car” “Car-on-demand”
<i>Enabling technologies</i>	Telecom (e.g. 5G) GPUs Lithium batteries	← AI LiDAR →	Mobile payments Route optimization Geolocational services
<i>New business categories</i>	In-car infotainment Smart car monitoring Commerce platform	← Intelligent car Cybersecurity →	Ridesharing / e-hailing Fractional car ownership Per-mile insurance
<i>Exemplary companies</i>	  	←  →	  
<i>Industry corollary</i>	Mobile devices (smartphones)	← Computer hardware →	Software, cloud computing, video / music rental

Initial perspectives on the “car as a device”

The car as a device

Guiding philosophy

The car is a multi-functional, intelligent device that serves as a commerce and data platform

Trends

“The connected car”
“The electric car”

Enabling technologies

Telecom (e.g. 5G)
GPUs
Lithium batteries

New business categories

In-car infotainment
Smart car monitoring
Commerce platform

Exemplary companies



Industry corollary

Mobile devices (smartphones)

Perspective

- The automotive industry is converging with the tech industry and expanding the capabilities of the car
- Owning platforms and interfaces will be key
- The same thing happened with smartphones 10 years ago
- New entrants (i.e. tech companies) have massive war chests and will be highly disruptive

Questions

- What strategies can help insulate incumbents from the changing market dynamics and ensure they retain their dominance?
- How should new technology entrants be thinking about disruption, land grabs, and profit pools in order to become market leaders?

We saw the same thing happen in the smartphone industry

The phone as a...



- Communication device



- Communication device
- Entertainment device
- Web browsing device



- Communication device
- Entertainment device
- Web browsing device
- Computing device
- Social media device
- Commerce platform

The car as a...



- Transportation device



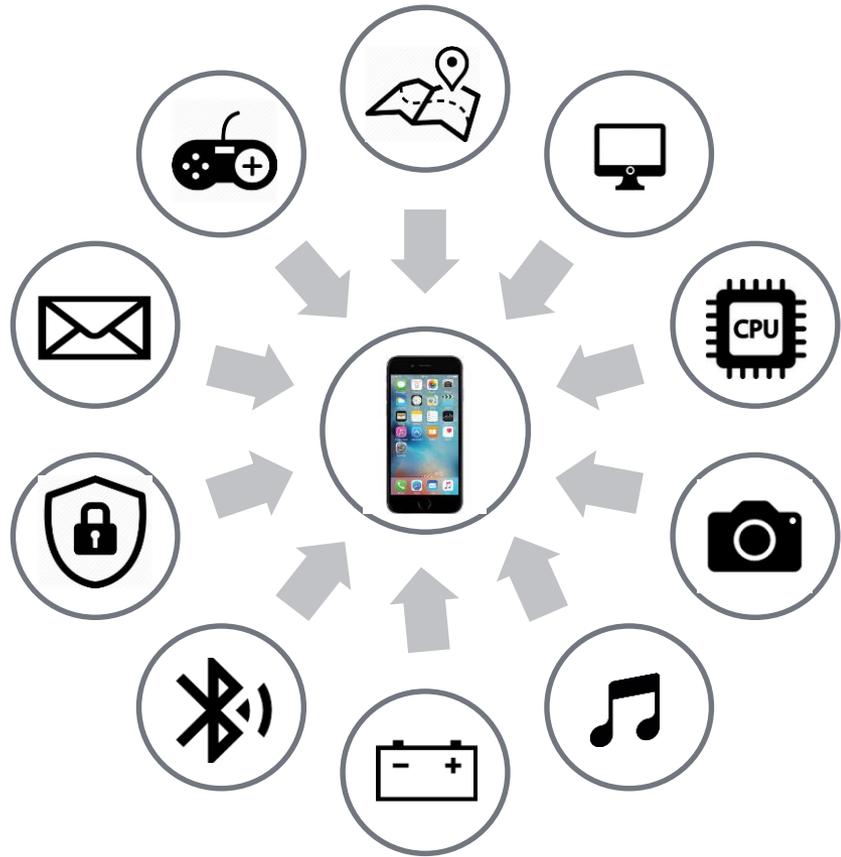
- Transportation device
- Entertainment device
- Telecommunications device



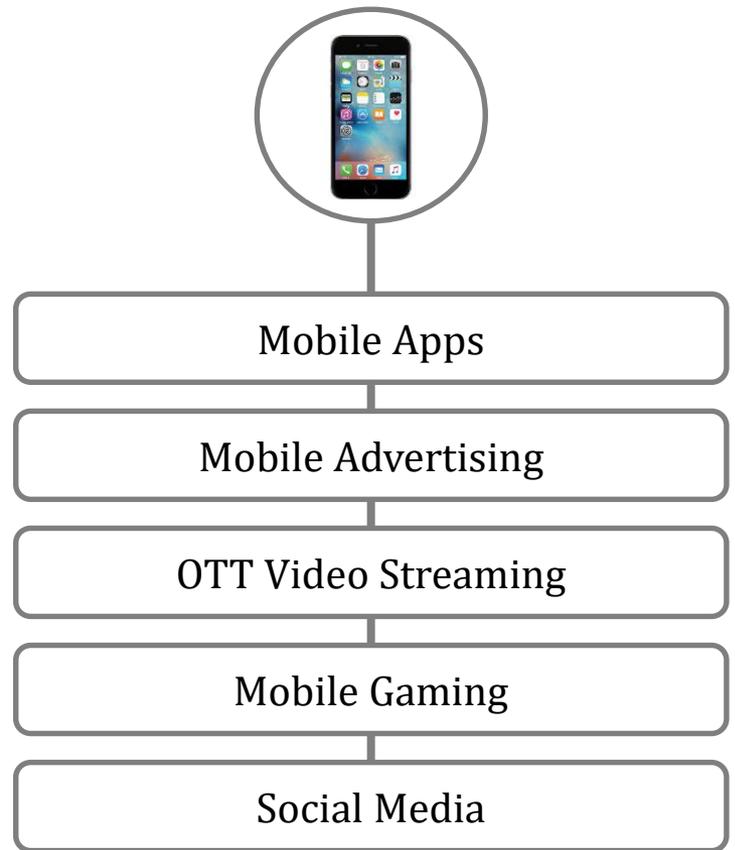
- (Autonomous) transportation device
- Entertainment device
- Telecommunications device
- Telematics device
- Ridesharing device
- Commerce platform

Phones evolved into “smartphones” when the telecom and tech industries converged

A convergence of the telecom and tech industries resulted in new products...



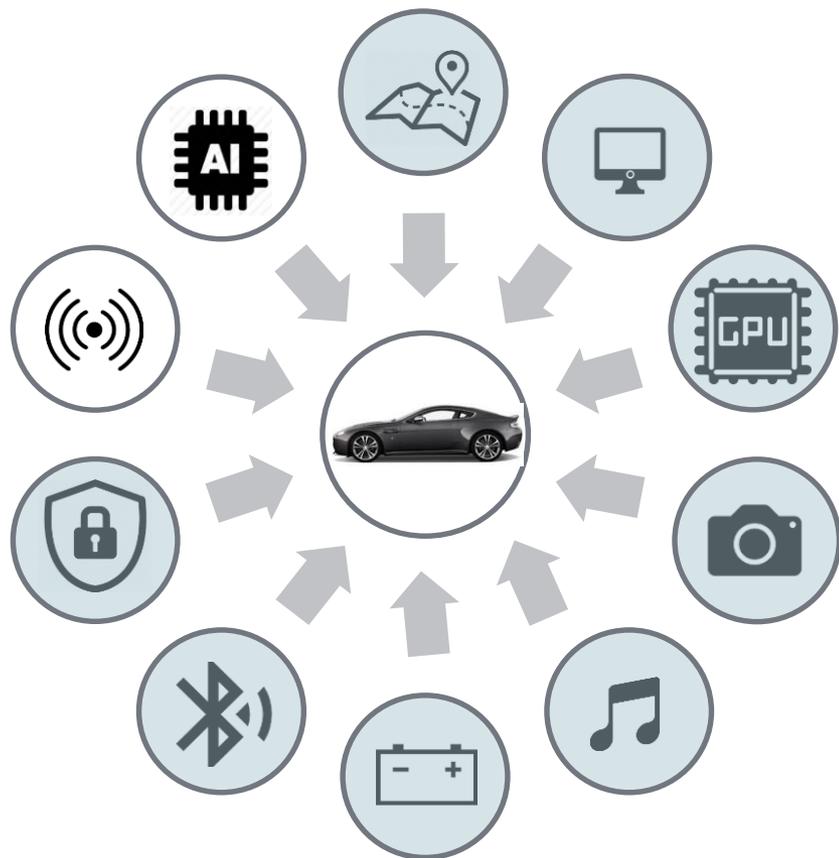
...and entirely new business models.



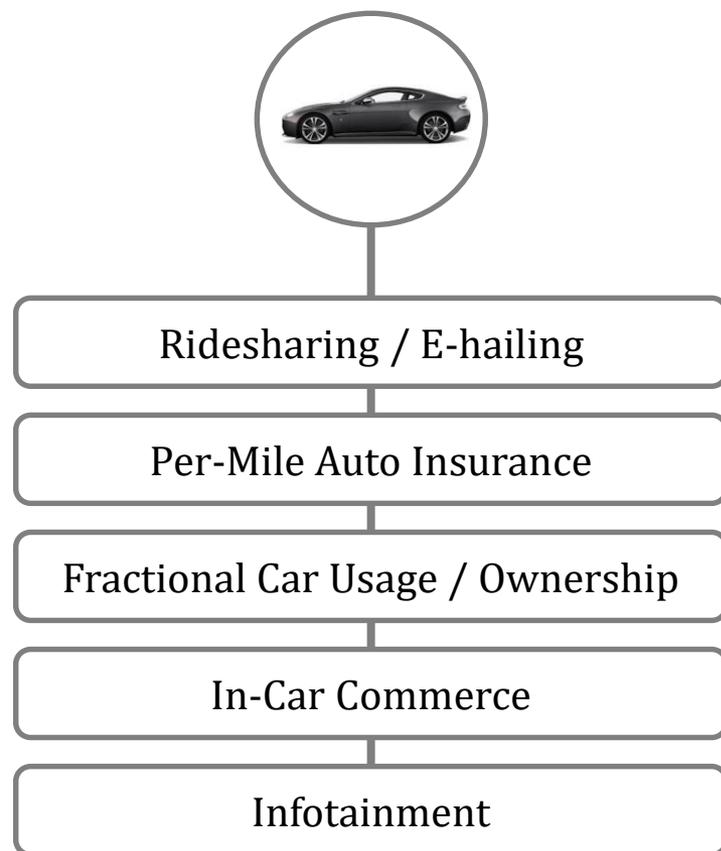
*Selected technology and business model examples

Now we're seeing a similar convergence between the automotive and tech industries

A convergence of the automotive and tech industries is resulting in new products...



...and entirely new business models.



○ Same convergence as seen in the smartphone industry

*Selected technology and business model examples

Major auto improvements are being shown at CES (tech conference), another indicator of industry convergence

Automotive Trends

CES Headline

Autonomous vehicles are a major focus of automakers and tech companies

- “Nissan Smart Autonomous Mobility pairs computer driving with a human backup”
- “Audi will have an autonomous car in 2020 using NVIDIA tech and AI”
- “Bose shows off ride-smoothing suspended seats for autonomous vehicle at CES”
- “BMW brings its self-driving, self-parking 5 Series prototype to CES”
- “Intel invests in Nokia's old mapping division for foothold in autonomous car tech”

Electric vehicles continue to become more mainstream

- “Honda reveals NeuV mini-EV, self-leveling motorcycle, and more at CES”
- “Chrysler will debut a fully electric Pacifica at CES”
- “ProPilot autonomous Nissan Leaf coming in 'near future,' but no word on longer range”

Battle over ownership of infotainment is on the horizon

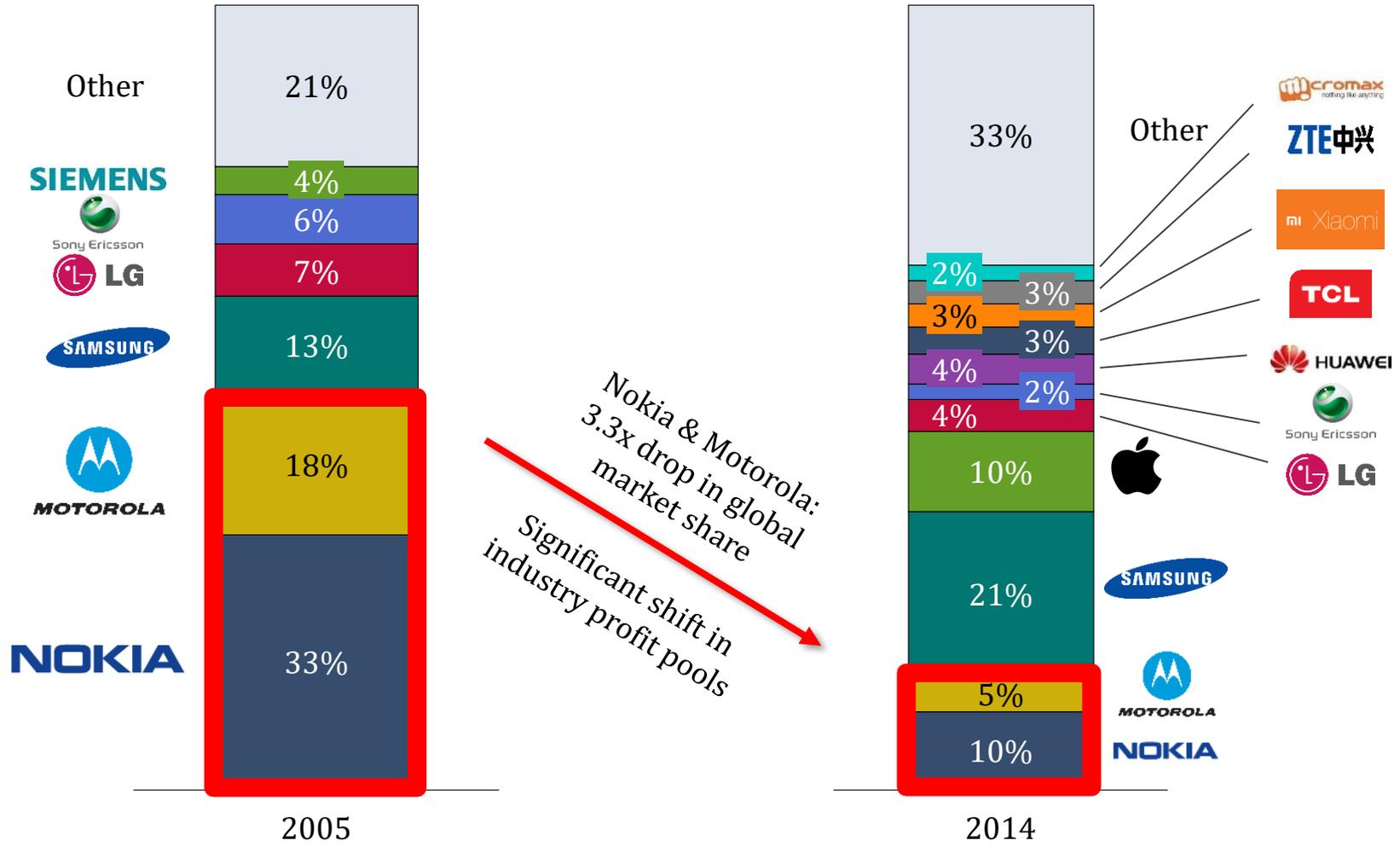
- “Android in-car infotainment goes way beyond Android Auto at CES 2017”
- “Alexa may be coming to more cars in the near future”
- “Toyota adopts SmartDeviceLink, Ford's smartphone integration standard”

Questions over how the connected car of the future will run and be secured

- “Automotive Grade Linux will be the backbone of your connected car”
- “Ford expands Sync capabilities with Amazon Alexa and IBM's Watson”
- “The Renault-Nissan Alliance takes a multi-pronged approach to autonomy and connectivity”
- “Volkswagen fleshes out Digital Key and User-ID personalization technologies at CES”

When the industry made the jump to smartphones, most of the device makers were overtaken even though they saw it coming

Percentage of Global Mobile Phone Sales



Source: <http://www.statista.com/statistics/271574/global-market-share-held-by-mobile-phone-manufacturers-since-2009/>

Some leaders failed to make the transition

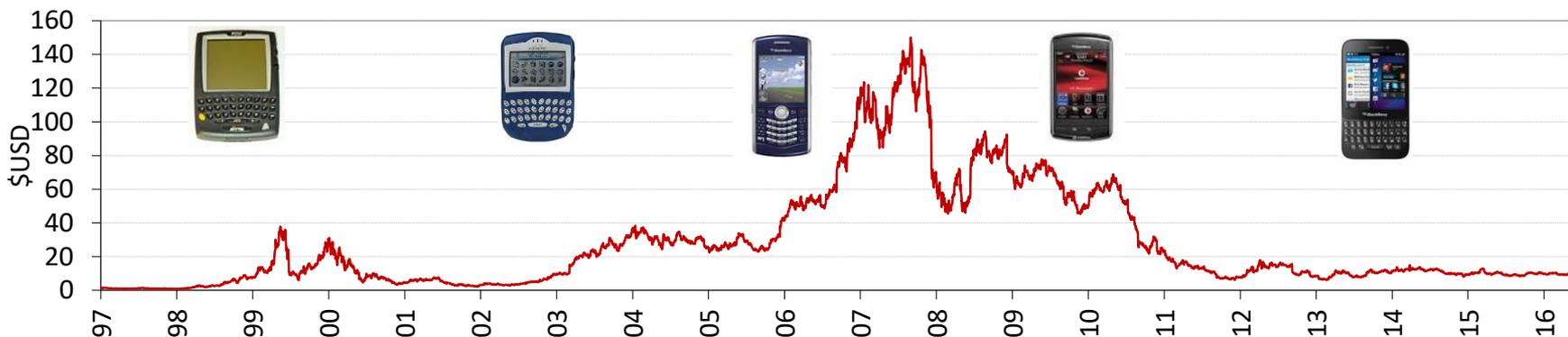
Case study on Research in Motion (RIM)

RIM/Blackberry Historical Share Price

Phase 1:
Early Years

Phase 2:
Global Expansion

Phase 3:
Decline



RIM goes public on the Toronto stock exchange; company sells pagers

Releases first Blackberry with mobile email

Adds voice calling capability

Releases first Blackberry with color screen

Releases Pearl devices with digital camera and multi-media functionality

Blackberry touch screen model gets overshadowed by the iPhone

Acquired QNX Software Systems to help reshape the Blackberry OS

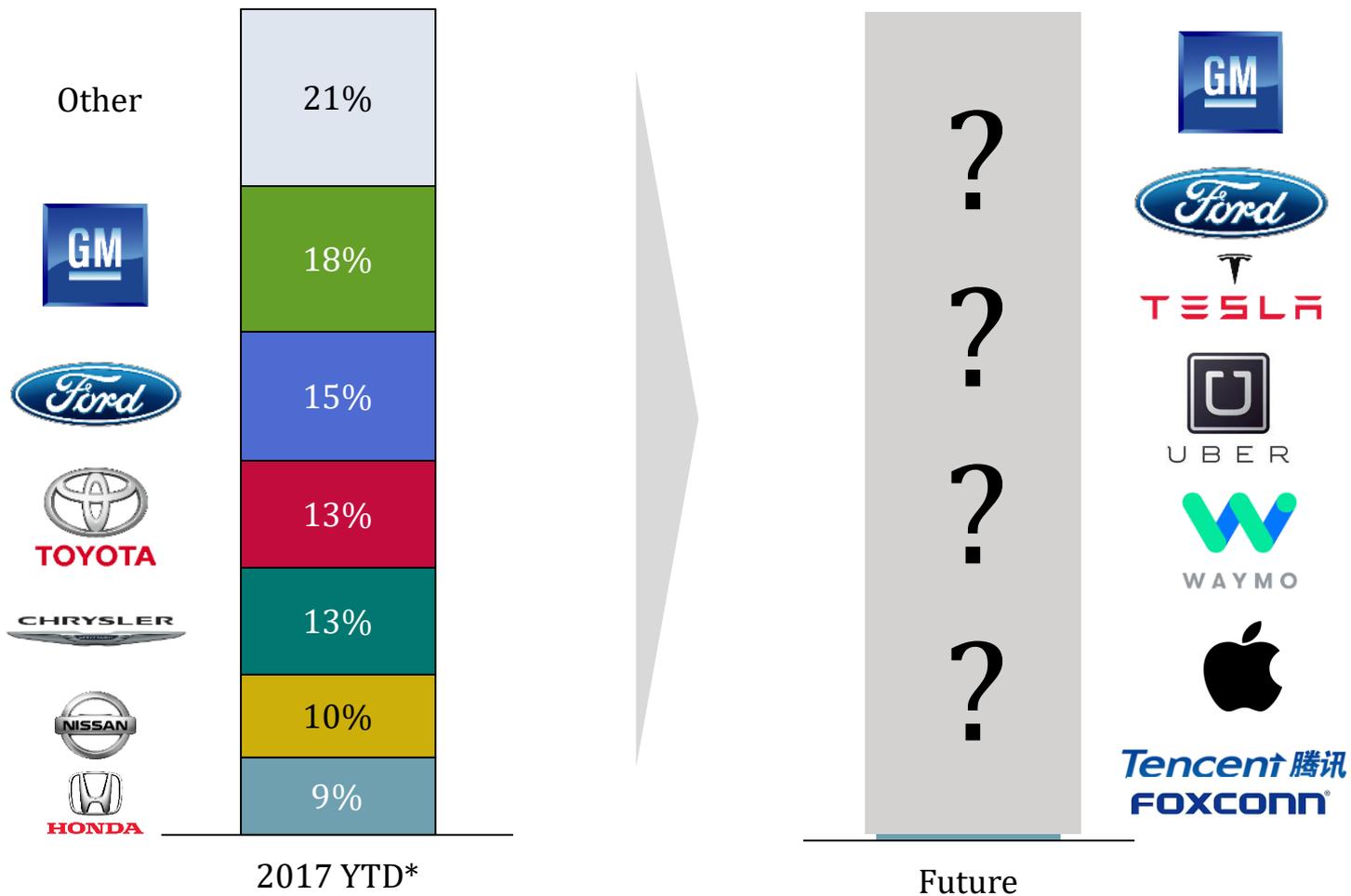
Software update is delayed; 5k layoffs

Ford hires 400 Blackberry employees to work on connected cars

RIM's original business model failed because of a poor OS/UI and not recognizing that their market, business devices, was being superseded by BYOD

Will the same thing happen in automotive?

Percentage of US Automobile Sales

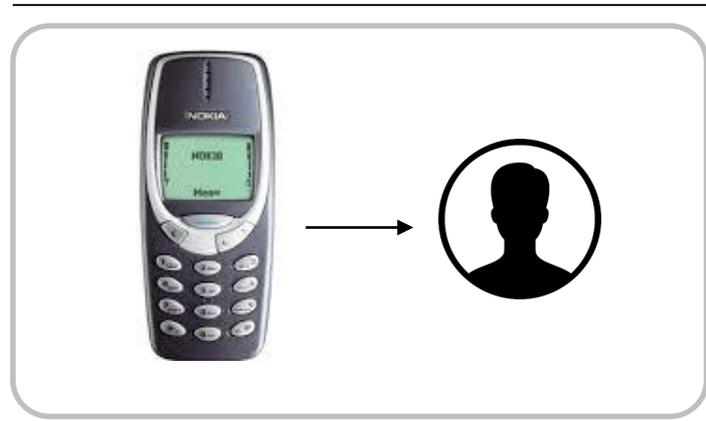


Source: http://online.wsj.com/mdc/public/page/2_3022-autosales.html

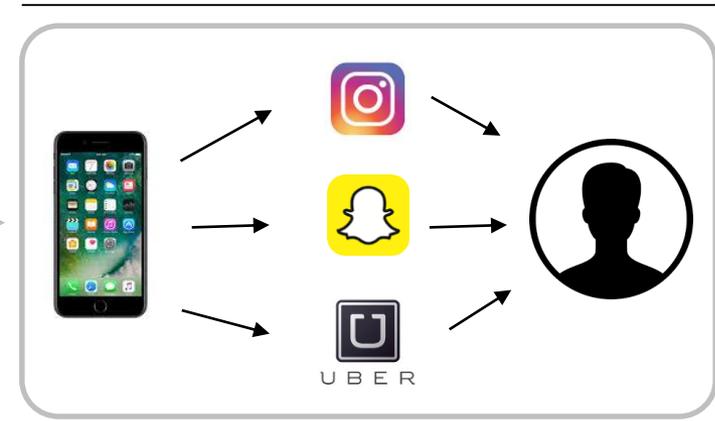
*Includes Jan-Feb 2017

Incumbents have the manufacturing expertise, but tech cos. understand how to manage commerce and data platforms

Old Business Model



New Business Model



Functionality

- Cellphones were meant for one thing: calling



- The smartphone is a **commerce and data platform** (e.g. entertainment, gaming, social media)

Cost

- Phones were expensive (e.g. the original Motorola DynaTAC x8000 cost \$3,995 in 1984)



- Carriers **give smartphones away for free** with calling plans

Profit Pools

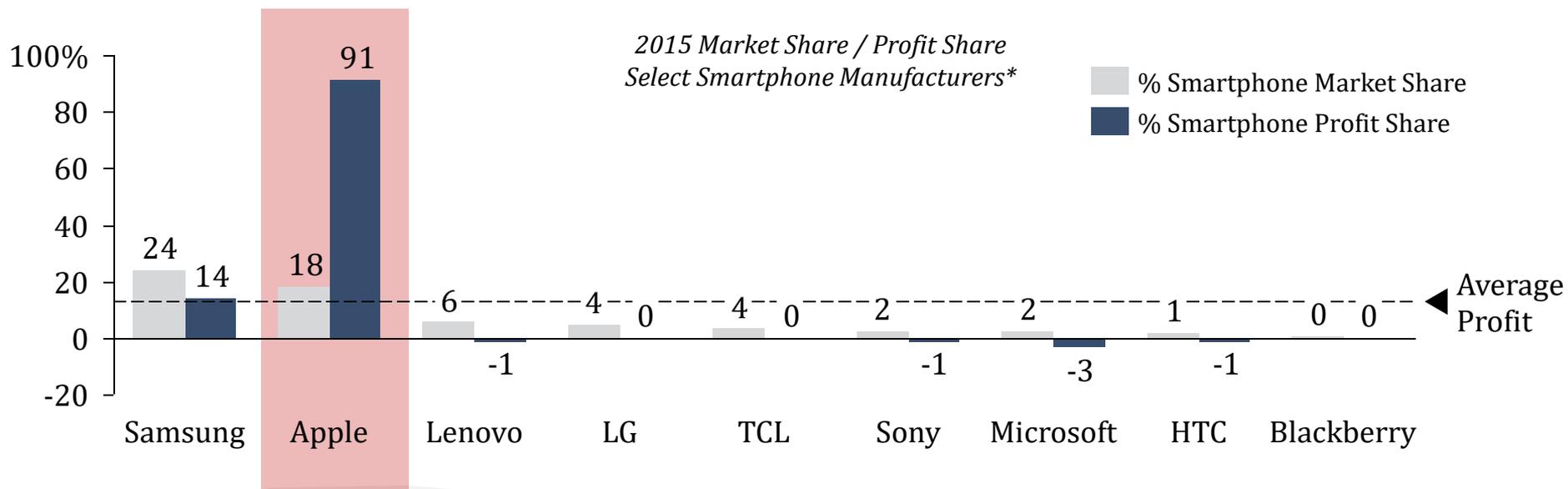
- Cellular carriers and device makers dominated the profit pools



- Only a few device makers profit (e.g. Apple); Smartphone **applications** cos. have huge valuations (e.g. Snapchat, Instagram)

Tech companies are the incumbents now, and autos need to adapt their strategy playbooks to the changing market

Just look at how Apple won the smartphone wars



* Excludes ZTE, Xiaomi, and Huawei because they did not report smartphone profits
Source: http://www.phonearena.com/news/Apple-accounted-for-91-of-smartphone-profits-last-year_id78318

**Attention:
Senior Executives**

As an auto incumbent, what's my next move?

Call to action

- A car is no longer simply a method of transportation, it is an intelligent device that functions as a commerce and data platform
- The same thing happened in the smartphone industry 10 years ago, and many of the incumbents failed to make the transition
- Technology companies that survived those smartphone wars are now entering your territory; they know how to own platforms and services



Action agenda

- Identify the profit pools that you seek to own and make sure that you have the appropriate technology rights
 - File and buy patents in these areas
 - Make acquisitions as needed
- If there is uncertainty about the direction of the market, partner with other leading companies and strike favorable cross license agreements so you aren't left behind
 - Make sure you're networked

The rise of the “car as a service” business model

The car as a service

Guiding philosophy

The car should be a service for users; the days of mass personal car ownership are ending

Trends

“The shared car”
“Car-on-demand”

Enabling technologies

Mobile payments
Route optimization
Geolocational services

New business categories

Ridesharing / e-hailing
Fractional car ownership
Per-mile insurance

Exemplary companies



Industry corollary

Software, cloud computing,
video / music rental

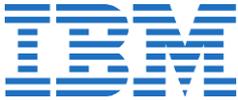
Perspective

- The rideshare industry poses a threat to autos and could reduce demand for cars in the long term
- Driverless car technology is a critical chokepoint because consumers care about it
- New entrants (i.e. tech companies) have massive war chests and will be highly disruptive

Questions

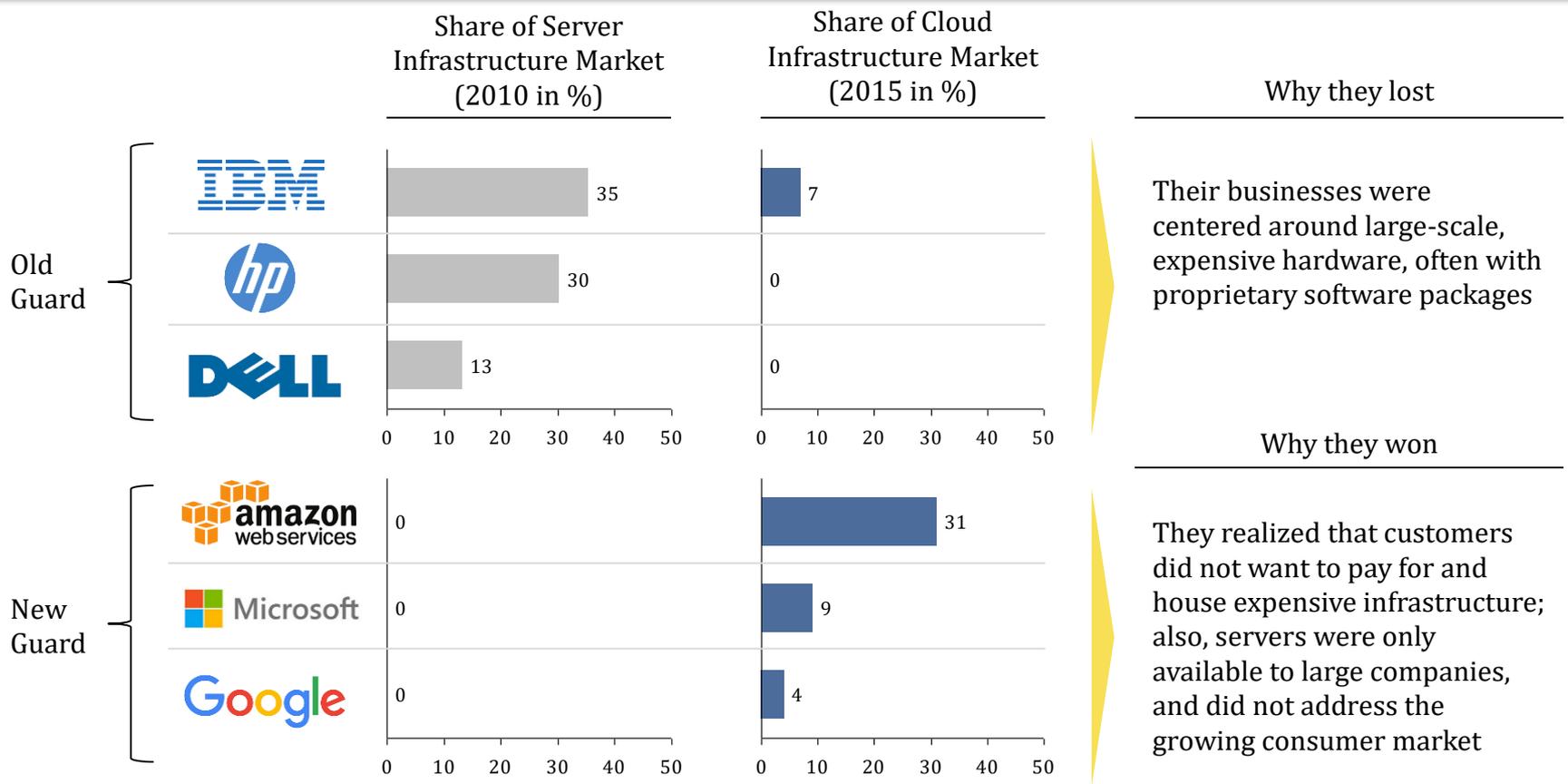
- What strategies can help insulate incumbents from the changing market dynamics?
- How should new technology entrants be thinking about disruption, land grabs, and profit pools?

When an industry shifts to a service model, there's winners and losers

	Incumbent		Disrupter	Why they won
Computing Infrastructure		→		Amazon reduced the total cost of ownership for computing infrastructure by splitting the cost of the server across multiple users
CRM Software		→		Salesforce's cloud-based software enabled lower pricing, and its flexible UI allowed for easier use
Video Rental		→		Netflix offered mail-order, then streaming services which gave consumers access to same content for less and removed the need for in-store browsing
Music		→		Spotify's subscription service gave consumers access to more music for less cost and allowed them to store music across multiple devices

In all cases, incumbents failed to realize the upside of the service model... autos: adapt sooner than later

IBM lost its hold of the computing infrastructure market with the rise of Amazon Web Services



Why they lost

Their businesses were centered around large-scale, expensive hardware, often with proprietary software packages

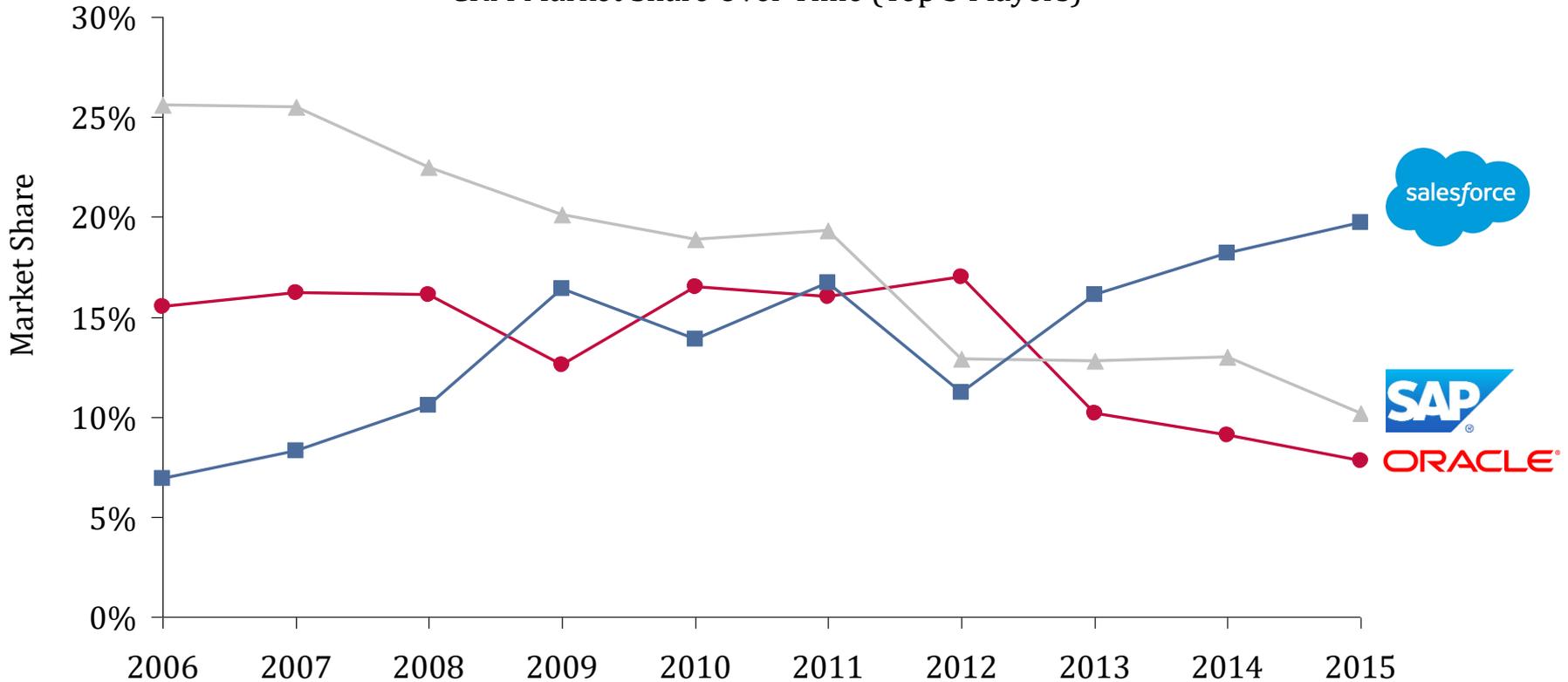
Why they won

They realized that customers did not want to pay for and house expensive infrastructure; also, servers were only available to large companies, and did not address the growing consumer market

How can auto incumbents avoid becoming the “old guard” of computing infrastructure?

Salesforce was able to take over sleeping incumbents Oracle and SAP when the CRM market shifted to SaaS

CRM Market Share Over Time (Top 3 Players)



Salesforce offered a scalable pricing model that lowered total cost of ownership for users

Companies like Microsoft adapted when the market shifted from hard disks to SaaS



<i>Cost to User</i>	A one-time, up-front payment	→	Billed a small monthly fee
<i>Access</i>	Software tied to single operating system	→	Software can be installed on up to 5 computers on a single license
<i>Software Features</i>	Applications like Word, Excel, and PowerPoint are static	→	Application features are constantly updated
<i>Storage</i>	Users do not get any additional data storage	→	Users get 1TB of OneDrive cloud storage
<i>Technical Supports</i>	Initial technical support is included for initial install only	→	Users get access to 24/7 technical support
<i>Total Revenue</i>	\$16.4B¹ (2007)	→	\$23.6B² (2016)

Microsoft knew that left unchecked, SaaS services like Google Docs could take away its market share... so it fought back

¹Includes Microsoft Dynamics business solutions revenue (source: Microsoft 10-K 2016)

²Includes Microsoft office 2016 revenues (source: Microsoft 10-K 2007)

Stepping back: what gave rise to the car as a service model? The utilization rate for cars is extremely low (around ~5%)

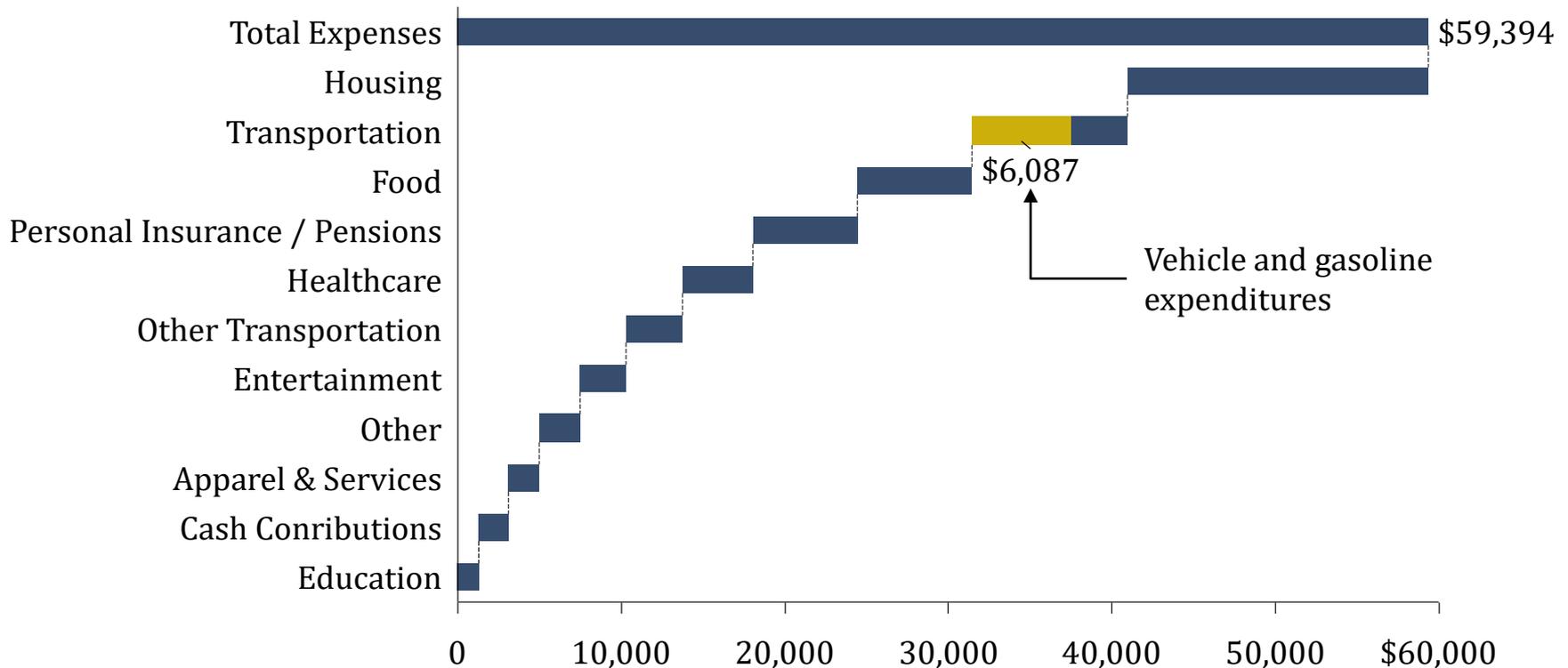
<i>Research Methodology Based on...</i>	<i>Average Time Cars are Parked</i>	<i>Source</i>	
1 Time drivers spend driving (from transportation surveys) and assuming one car per driver	→	95%	US Department of Transportation
2 Using car mileage and average speeds	→	96%	Union Internationale des Transports Publics
3 Number of cars, car trips, and average duration of the trip	→	96%	RAC Foundation

According to multiple studies, the average vehicle is parked ~95% of the time

Sources: <http://www.reinventingparking.org/2013/02/cars-are-parked-95-of-time-lets-check.html>;
<http://fortune.com/2016/03/13/cars-parked-95-percent-of-time/>

Stepping back: what is giving rise to the car as a service model? A car is also one of the biggest capital expenditures for U.S. consumers

Average Expenditures per US Consumer, (\$ USD)



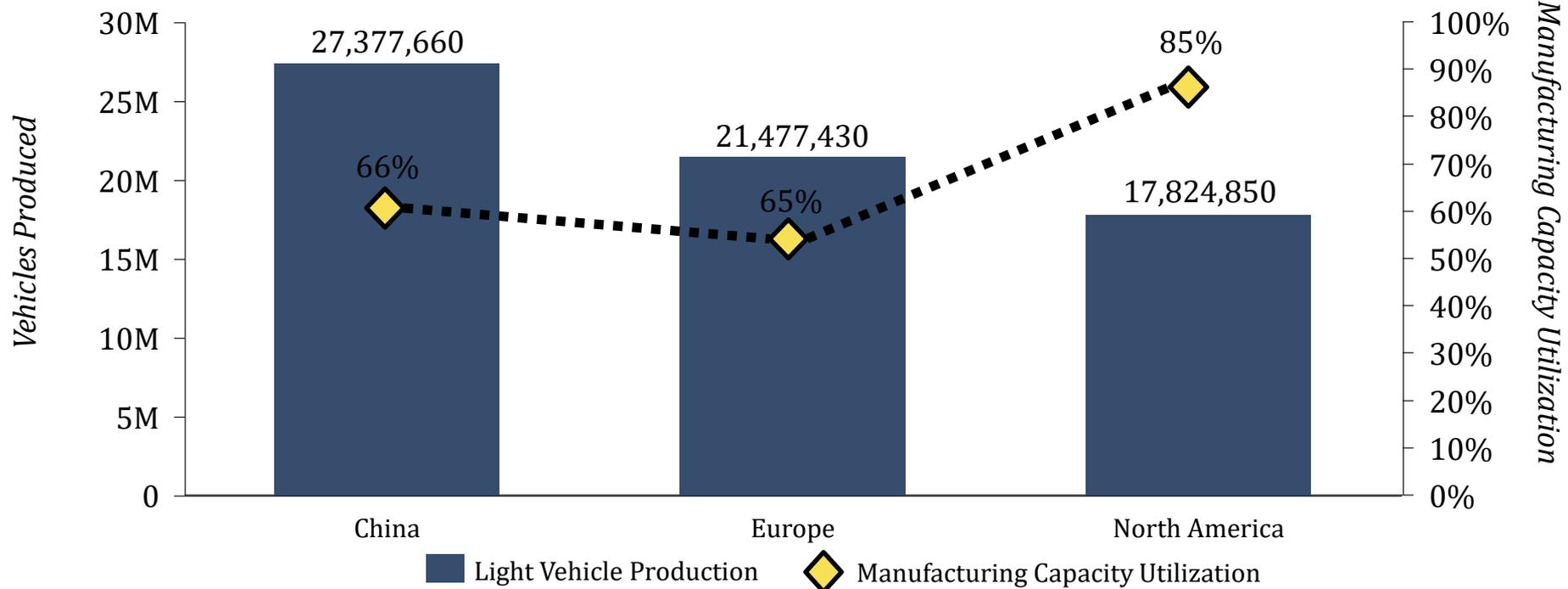
The average American spends more than 10% of their annual budget on vehicle expenses

The high price of cars and their low utilization rate has helped open the door for ridesharing companies

Selected Ridesharing Companies	Current Valuation (\$B)	Country of Origin	Founded	Funding to Date
 UBER	68		2009	\$13.7B
 DiDi <small>More than a journey</small>	34		2012	\$7.4B
 lyft	6		2012	\$2.0B
 OLA	4		2010	\$1.6B
 Grab	3		2012	\$1.4B
 zipcar.	0.5		2012	\$108M
 CAR 2GO	0.1E		2012	\$10M

What happens to major auto incumbents when ridesharing reduces the need for cars?

Leading Light Vehicle Producing Areas
(Production and Capacity Utilization)



Manufacturing capacity utilization is already very low for the top light vehicle producing geographies

Sources: Federal Reserve datasheets; HIS data; <http://www.reuters.com/article/china-autos-forecast-idUSL3N1401PS20151211>; <http://www.automotivemanufacturingsolutions.com/focus/europe-in-recovery>

Industry leaders on the future of personal car ownership

Quote	Attributed to	Date / Source
"If we share rides in shared cars, we will only need 10% of the cars we have today."	Robin Chase, Co-Founder of Zipcar	February 2017 Wharton Digital Press
"You can't have every resident of Delhi driving a car — that just wouldn't work... They just don't have the infrastructure to support it, so why build it out? So that will be a big deal."	Travis Kalanick, Former Uber CEO	April 2017 New York Times
"Our strength is not necessarily in the dense urban environments like in New York or San Francisco or LA, so we see this as an additive opportunity for our business because the strength of our core business, specifically in the US, is in trucks and SUVs...Today, it's done with ride-sharing 1.0. But when we get to autonomous, you take a lot of those pain points and you do it more efficiently and more safely...So we think the adoption will be in these dense urban areas and that it will complement our current business nicely."	Mary Barra, GM CEO	December 2016 Business Insider
"By 2025, private car ownership will all-but end in major U.S. cities."	John Zimmer, Lyft Co-Founder	September 2016 Medium.com

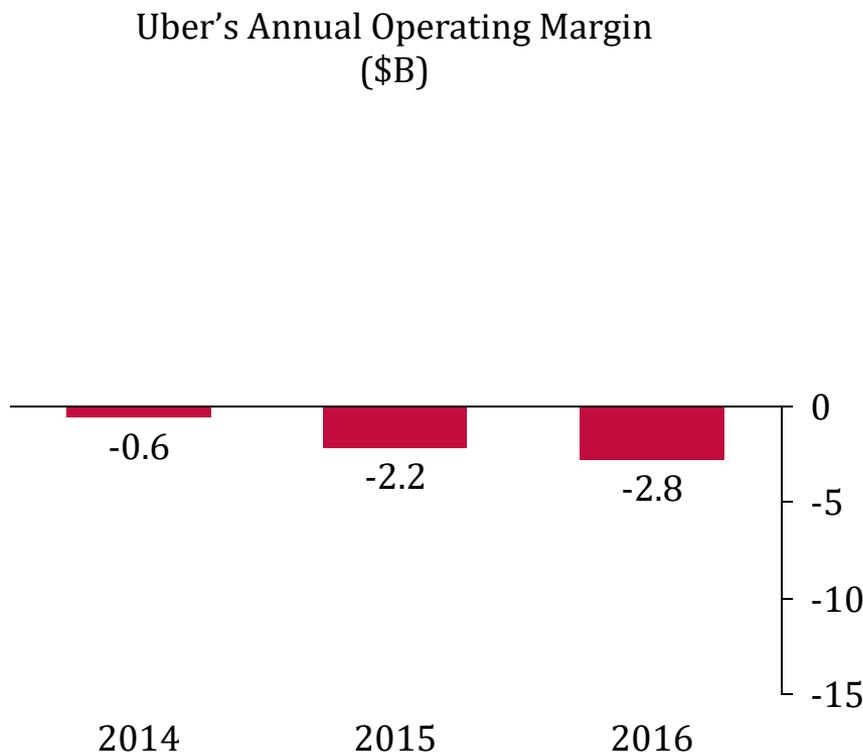
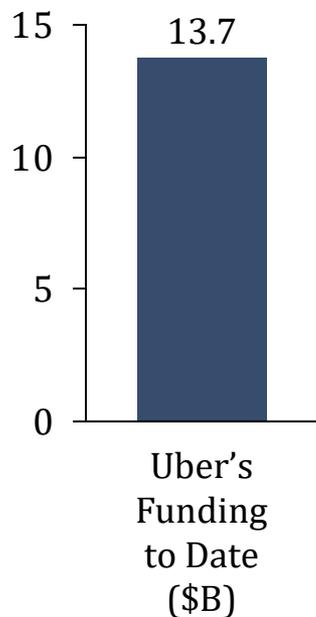
Ridesharing companies like Uber are beating out taxi companies because they offer much lower prices and are more convenient

Car Costs		 UBER	vs.	 TAXI
Fixed	Driver	✓ Much lower (but subsidized)		Much higher
	Marketing / Fleet Mgmt.	✓ Lower		Higher
	Insurance	Higher	✓	Lower
	License, Registration and Regulatory	✓ Lower (Avoids regulation)		Higher (Taxi medallion)
	Depreciation	Same		Same
Variable	Financing	Higher (Driver pays)	✓	Lower (Scaled financing)
	Gas / Oil	Same		Same
	Maintenance	Higher	✓	Lower
	Parts	Higher	✓	Lower
Total Cost per Mile		90 cents per mile¹		270 cents per mile²

¹<http://uberestimate.com/prices/>

²<https://www.taxifarefinder.com/rates.php?lang=en>

Here's the catch: Uber is cheap because it appears to subsidize its drivers with investor funding



Takeaways

Uber has **~\$13.7B in funding** to date

Uber announced it lost **\$2.8B** in 2016

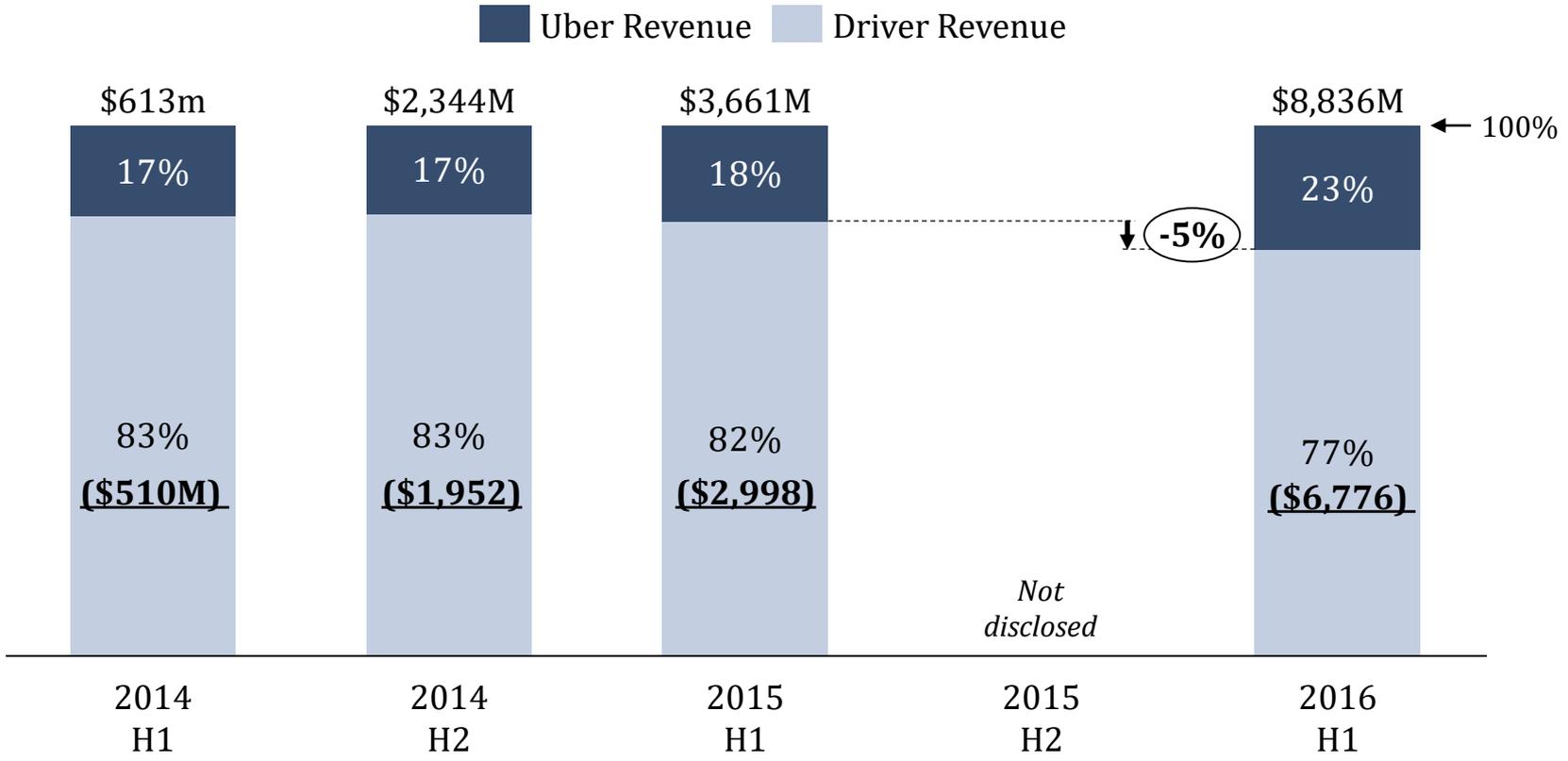
As Uber grows, history has shown that it loses more

In a few years, Uber could get outsized benefits from autonomous vehicles

At its current burn rate, Uber could run out of funding in the next few years

Sources: <http://www.nakedcapitalism.com/2016/11/can-uber-ever-deliver-part-one-understanding-ubers-bleak-operating-economics.html>;
<http://money.cnn.com/2017/04/14/technology/uber-financials/>;
<https://techcrunch.com/2016/12/21/uber-losses-expected-to-hit-3-billion-in-2016-despite-revenue-growth/>

Uber needs autonomous vehicles to be sustainable



Uber driver revenue was \$6.8B in H1 2016; when Uber cut driver pay by 5%, it generated \$440M for the business

If Uber can remove the driver entirely, it could one day be cheaper than car ownership

Car Costs		UBER w/ drivers	UBER w/out drivers	Average Car Cost per Mile for US Consumer*
Fixed	Driver	Much Higher	Much Lower	-
	Marketing / Fleet Mgmt.	Higher	Higher	-
	Insurance	Same	Same	8.15
	License, Registration and Regulatory	Same	Same	4.58
	Depreciation	Much Lower	Much Lower	25.06
Variable	Financing	Same	Same	4.55
	Gas / Oil	Same	Same	8.45
	Maintenance	Same	Same	5.28
	Parts	Same	Same	1.00
Total Cost per Mile		90 cents¹	35 cents²	57 cents³

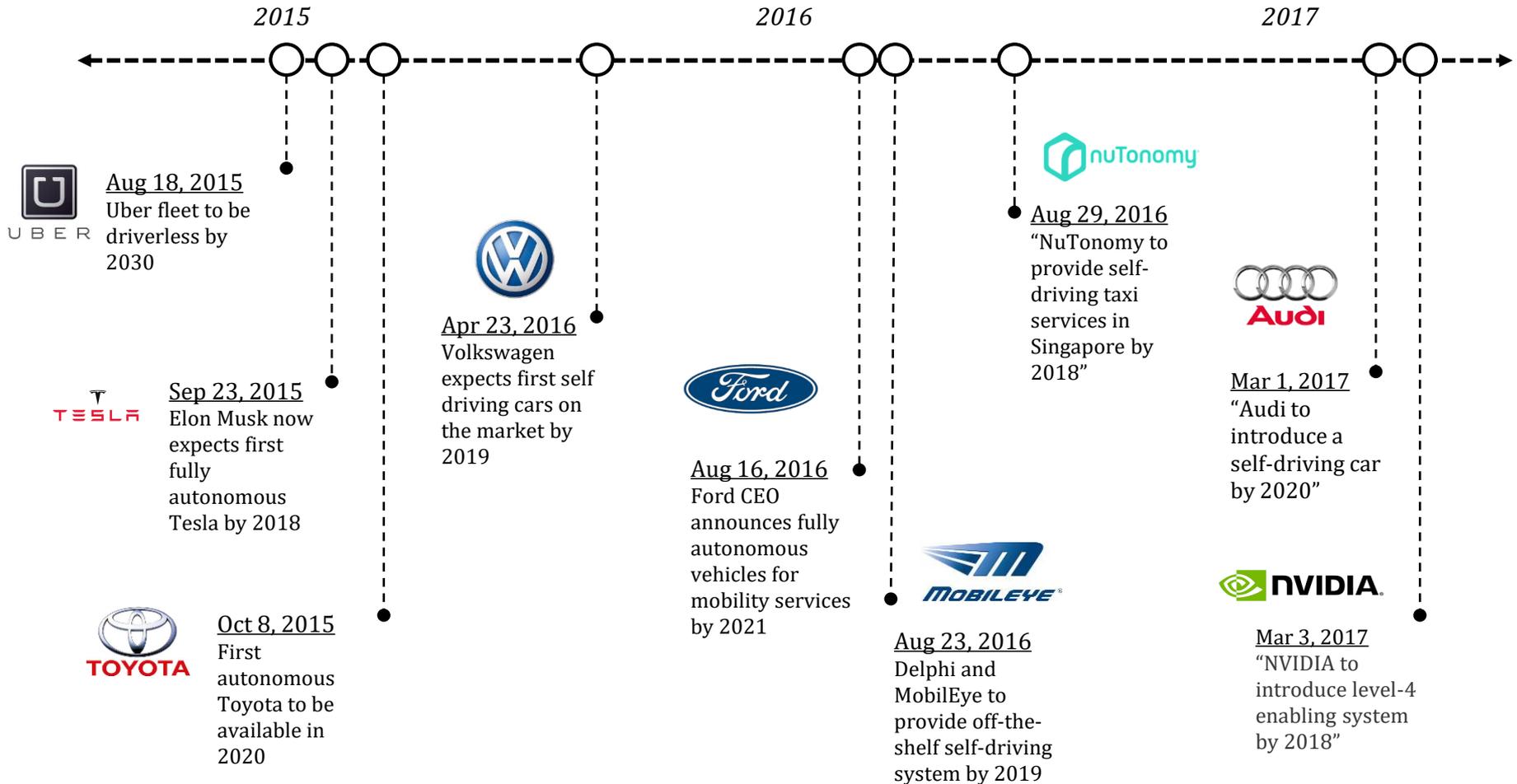
¹<http://uberestimate.com/prices/>

²<http://www.marketwatch.com/story/demand-for-driverless-cars-could-boost-uber-to-2016-09-19>

³<http://exchange.aaa.com/automobiles-travel/automobiles/driving-costs/#.WNk7EDvYtRY>

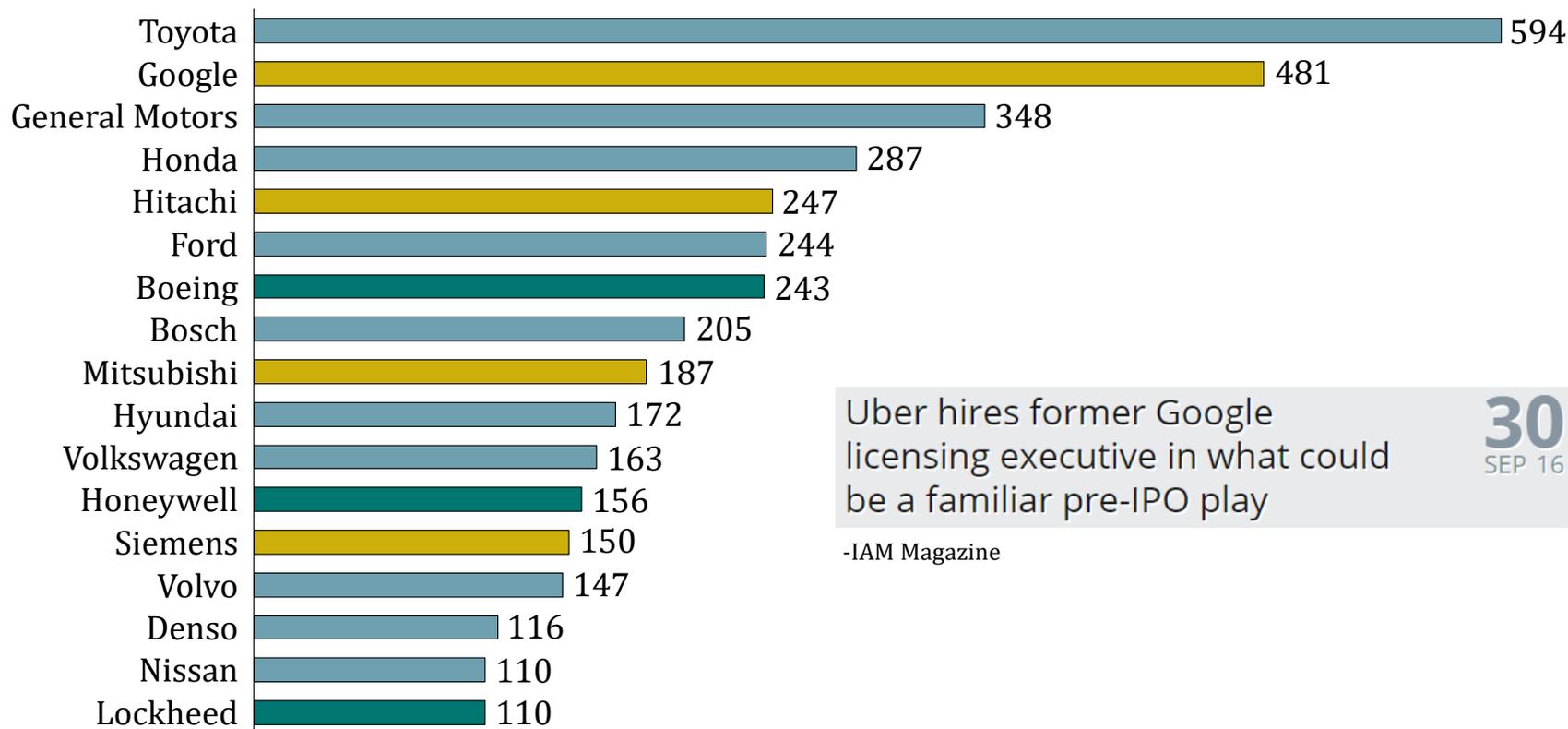
The driverless car race is now

Selected Autonomous Driving Press Releases



Uber sees the need for autonomous vehicle IP – others in auto and tech are bulking up

Self-driving/Autonomous Vehicle Patent Holdings (US, EP, KR, CN, JP grants and applications)



Uber hires former Google licensing executive in what could be a familiar pre-IPO play

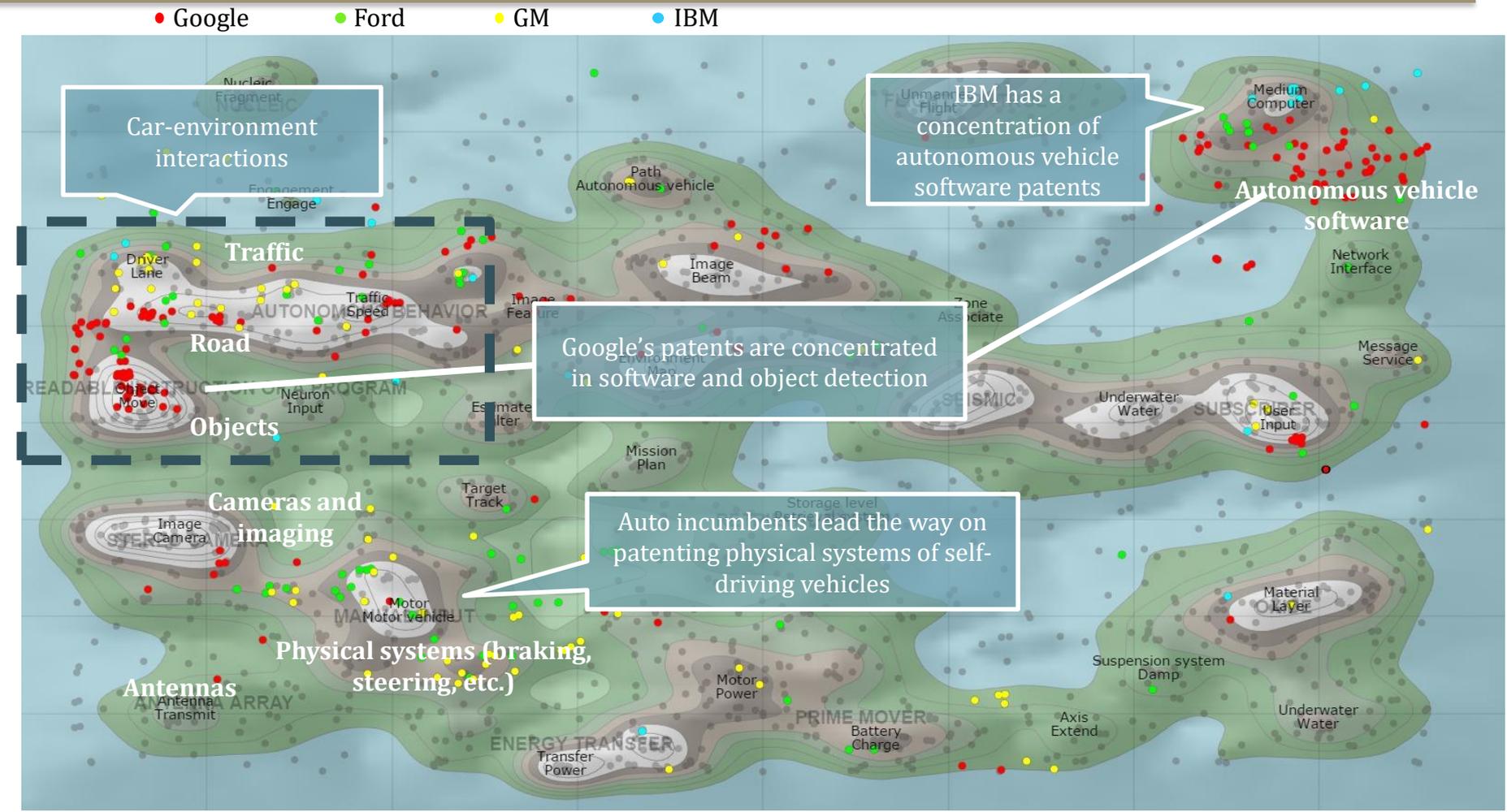
30
SEP 16

-IAM Magazine



Search using Thomson Innovation: Title/Abstract/Claims field text contains: (autonomous OR self-driving OR "self driving" OR driverless) AND (vehicle OR vehicles OR car OR cars OR automobile OR automobiles), priority year 1997 or later. US, EP, KR, CN, JP apps and grants. Returned 17,516 distinct application numbers. Exemplary companies shown above

Established auto incumbents and tech giants are building IP positions



Thomson Innovation "Themescape" map above (originally developed by STG founding partner, Kevin Rivette) clusters patents by the similarity of words in the patents. Mounds represent high concentrations of patents. Colored dots represent patents held by the companies specified above. The patents represented include documents related to autonomous vehicles, using the search described on the previous page.

Companies not traditionally linked to auto are also thinking about driverless tech (e.g. Amazon)

TECH

Amazon Forms Team to Focus on Driverless Technology

Group could help retailer deliver packages quickly as it builds out its supply chain and logistics network



“Amazon.com has created a team focused on driverless-vehicle technology to help navigate the retail giant’s role in the shake-up of transportation.”

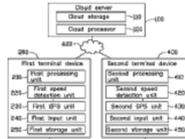
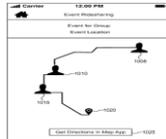
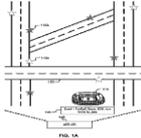
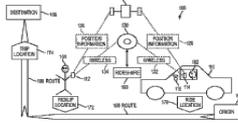
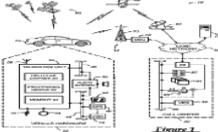
“In January, Amazon won a **patent for coordinating autonomous vehicles** in a roadway.”

“A job posting on **Amazon’s site calls for a research scientist ‘to develop future mobility** and transportation systems’ at Amazon Robotics, which largely focuses on the company’s warehousing technology.”

“The biggest portion of Amazon’s spending and energy has gone toward another type of autonomous means of transport: **drones.**”

-WSJ, March 30, 2017

Meanwhile, auto incumbents and tech giants are staking out the rideshare domain

Company	Patent #	Title	Description	Filing year	Figure
	20160352845 (pending)	Ride-sharing system and method	Method for controlling a ride-sharing service	2016	
	20160321566 (pending)	Ride-sharing joint rental groups	A system allowing a community of users to communicate and rent available vehicles	2015	
	20160026936 (pending)	Event-based ridesharing	A system allowing users to RSVP to an event and say whether the user is willing to take passengers to that event	2014	
	20140082069 (pending)	Automated coordination of ride sharing between members of social group	Allows individuals to propose and accept transportation routes for ride sharing with friends	2012	
	8036824 (issued)	System and method for setting a rideshare transaction fee	Can modify fee en route depending on real-time demand for ride sharing services	2011	
	8688532 (issued)	Real-time ride share system	Matches driver and rider based on telematics and relays a background check on the rider to the driver	2009	

Just this past year, Tesla responded with its own ridesharing plans

Details on Tesla's rideshare plans: The "Tesla Network"



“You will also be **able to add your car to the Tesla shared fleet just by tapping a button on the Tesla phone app and have it generate income for you while you're at work or on vacation**, significantly offsetting and at times potentially exceeding the monthly loan or lease cost...This would be something that would be a significant **offset on the cost of ownership for a car and a revenue generator for Tesla** as well, but the majority of the revenue would go to owners.”

– Elon Musk, 2016 Q3 Earnings Call

Long term: Uber and big tech cos. need to get to L4 automation; in the meantime, the autos benefit from another trend

		SAE Automated Driving Definitions						IP Position
Paradigm	Example Company	L0 No Automation	L1 Driver Assistance	L2 Partial Automation	L3 Conditional Automation	L4 High Automation	L5 Full Automation	
Old Guard OEM		<i>Protecting nest egg by investing in autonomous driving technology, but also wins if driverless cars fail</i>						Strong
Emerging OEM		<i>Brand is driven by being a perceived leader in tech; it wants to be a first-mover in driverless cars</i>						Weak
New Tech Entrant		<i>Only wins in a world with no drivers</i>						Strong
"Service" Providers		<i>Only wins in a world with no drivers</i>						Weak

Service providers fail if they don't win the driverless car race; having the right IP will help

**Attention:
Senior Executives**

As an auto incumbent, what's my next move?

Call to action

- The rideshare industry poses a threat to auto incumbents and could reduce demand for cars in the long term
- Driverless car technology is a critical chokepoint because consumers care about it
- You need to start carving off your own piece of the IP landscape and preventing ridesharing companies from owning the whole service



Action agenda

- Make sure you're aggressively filing patents in chokepoint areas
- Leverage your patent position to encourage favorable partnerships
 - Induce partnerships by demonstrating the relative strength of your IP
 - Lock in favorable royalty rates now before it's too late, and benefit from new revenue streams

**Attention:
Senior Executives**

As a rideshare company, what's my next move?

Call to action

- The rideshare business model will only work in the long-term if driverless cars can help reduce operating expenses
- Automated driving technology is already being patented heavily by tech companies
- There is a good chance that these tech companies (e.g. Google) will move in, force you to pay royalties, and / or offer their own suite of services



Action agenda

- Start assembling a war chest
 - Figure out where you should be filing your patents based on where the industry is heading
 - Identify high-value patent portfolios and acquire the relevant ones
- Develop favorable partnerships / joint ventures with leading driverless car tech companies now
 - Spread the risk out across multiple companies, so you don't get left behind if your in-house technology doesn't take off

Part 3: Disruptors are benefiting from the evolving automotive value and supply chains

Auto and tech are converging

- 1 Tech companies have deep pockets and will be disruptive; Silicon Valley thinks differently than the auto industry

Disruption of the auto business model

- 2 The car is becoming both a multi-functional device and service platform; this happened in the smartphone industry 10 years ago, and many incumbents fell (e.g. Nokia, RIM)

Disruptors are benefiting from the evolving automotive value and supply chains

- 3 Tier 1 and 2 suppliers own significant design and manufacturing capabilities, enabling disruptors to more freely enter the field; this is leading to new market dynamics and profit pools

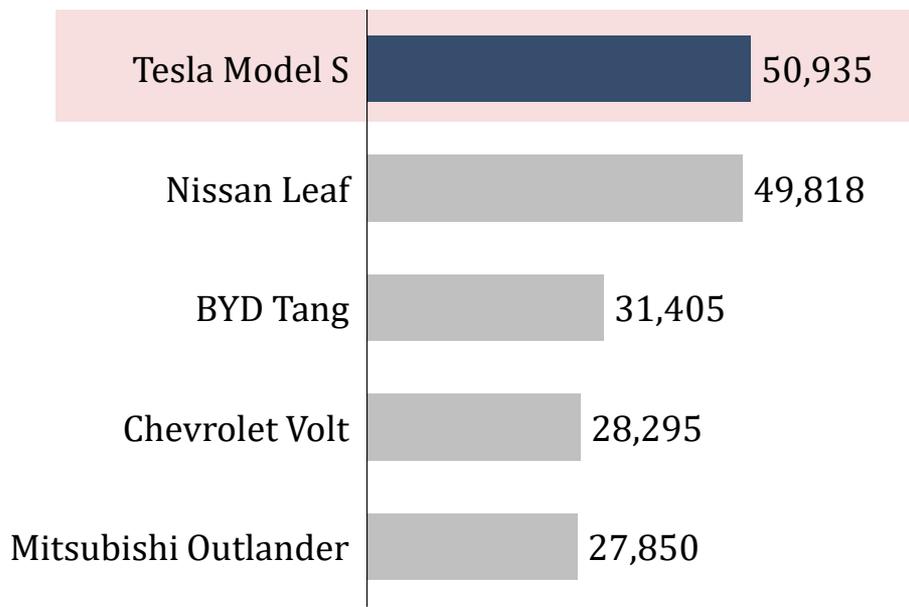
The auto industry in China is booming, but...

- 4 Chinese autos looking to expand internationally into profitable markets will need to have the appropriate technology rights and strategies

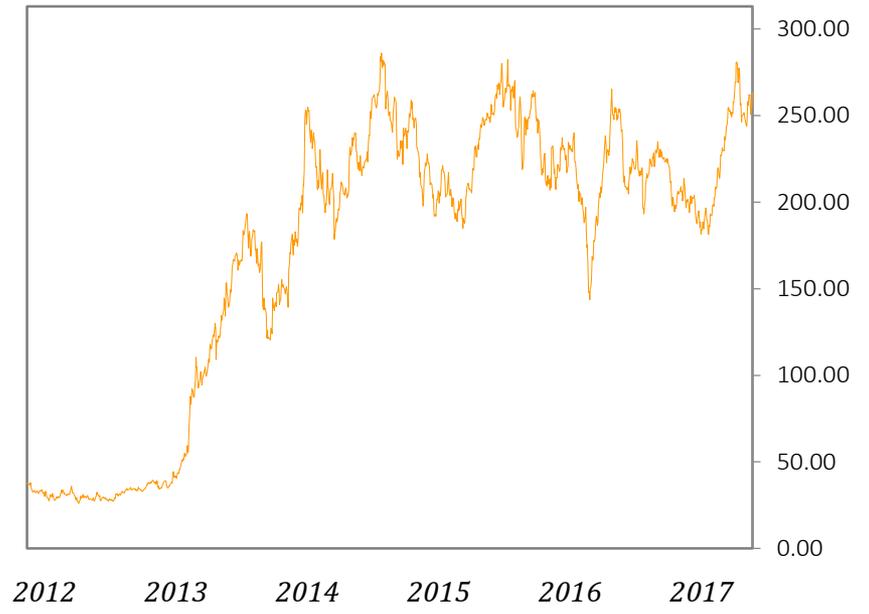
How is it that a young OEM like Tesla can emerge essentially from thin air?



Top Selling EV Models in 2016 (Units)



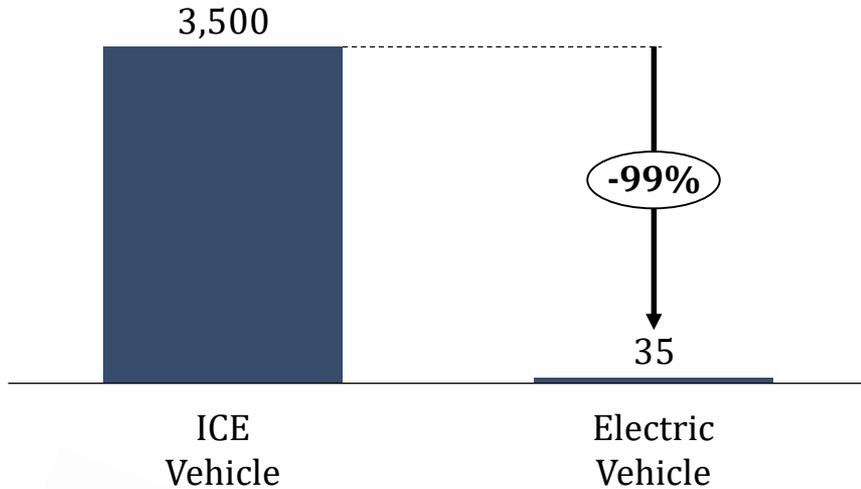
Tesla Stock Price (2013-2017)



Tesla has had a meteoric rise to the top of the EV car market, outperforming longstanding incumbents

Electric vehicles have far fewer parts than ICE cars, which enables companies like Tesla to have simplified supply chains

Number of Powertrain Parts



“The ICE powertrain has roughly 3,500 parts, but an electric powertrain has approximately 35 parts....At the OEM-level, you have big plants with workers assembling combustion engine parts and gear boxes...If you do not need ICE products, you have an employment problem.”

-Horst Bennis, CEO of Rheinmetall Automotive

This dynamic is what allows a disruptor to enter the auto industry

As a result of its simplified supply chain, Tesla can provide highly customizable cars to consumers with ease

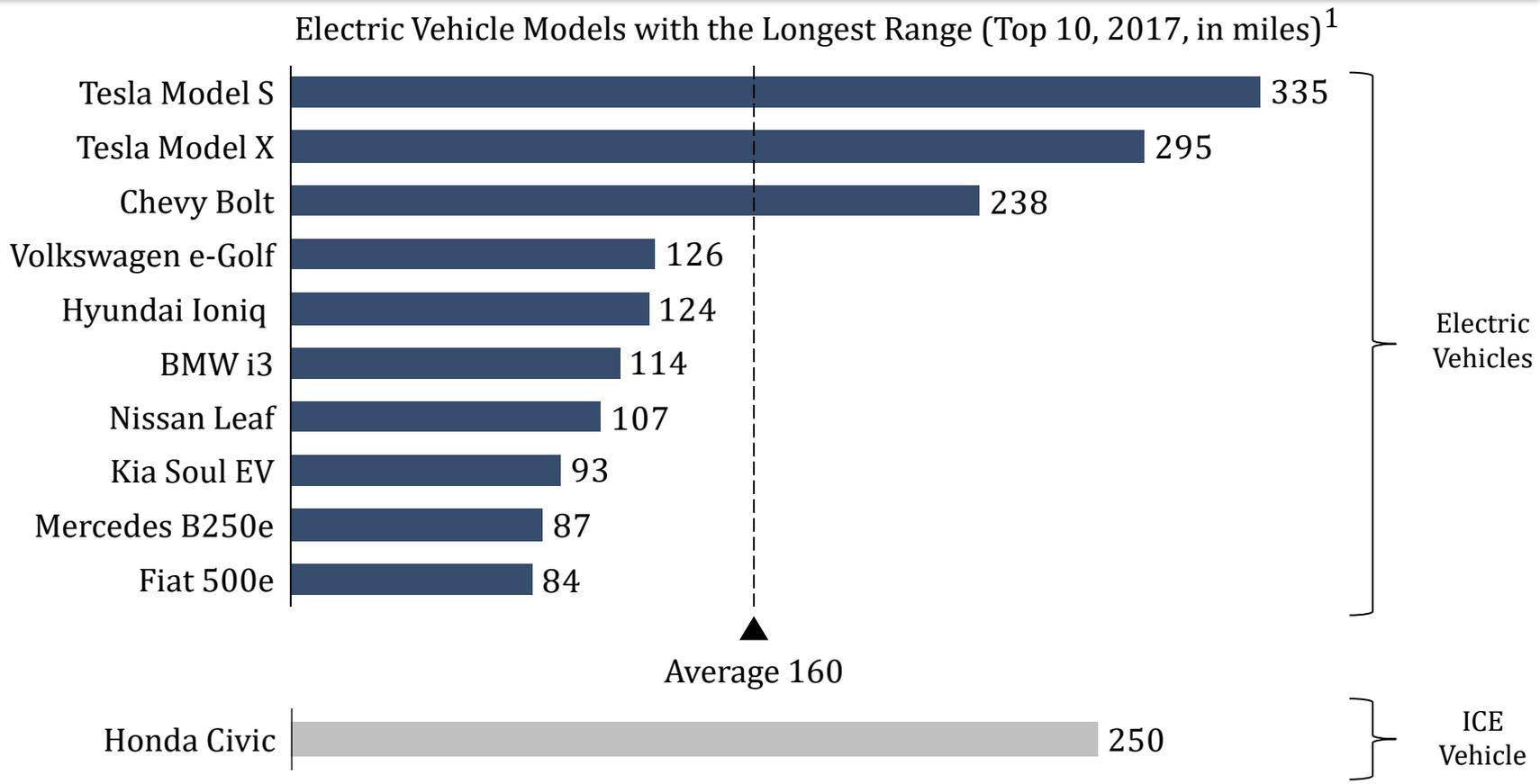


Tesla Model S

Series	60 kWh		75 kWh		90 kWh	100 kWh	
	60	60D	75	75D	90D	P100D	100D
Drivetrain	RWD	AWD	RWD	AWD	AWD	Ludicrous	AWD
Range	210 mi	218 mi	249 mi	259 mi	294 mi	315 mi	335 mi
Top speed	130 mph	130 mph	140 mph	140 mph	155 mph	155 mph	155 mph
0-60 mph	5.5 sec	5.2 sec	5.5 sec	5.2 sec	4.2 sec	2.275 sec	4.2 sec
Max. power, motor	285 kW	386 kW	285 kW	386 kW	386 kW	581 kW	Unavailable
Max. power, battery	302 hp	Unavailable	Unavailable	Unavailable	417 hp	605 hp	Unavailable
Max. torque	317 lb·ft	Unavailable	Unavailable	Unavailable	485 lb·ft	902 lb·ft	Unavailable
Price	\$68,000	\$73,000	\$74,500	\$79,500	\$89,500	\$134,500	\$95,800

Sources: <https://www.tesla.com/models/design?redirect=no;>
<https://moneymorning.com/2014/05/08/tesla-suppliers-list-these-26-companies-help-make-a-model-s-sedan/>

Once the range gets to 450 miles per charge, a major shift away from ICE occurs – Tesla is closer than others



**80% of the US population has a daily work route that's <40 miles.
95% of EVs sold today can handle daily commuting.²**

¹ <https://cars.usnews.com/cars-trucks/electric-cars-with-the-longest-range>

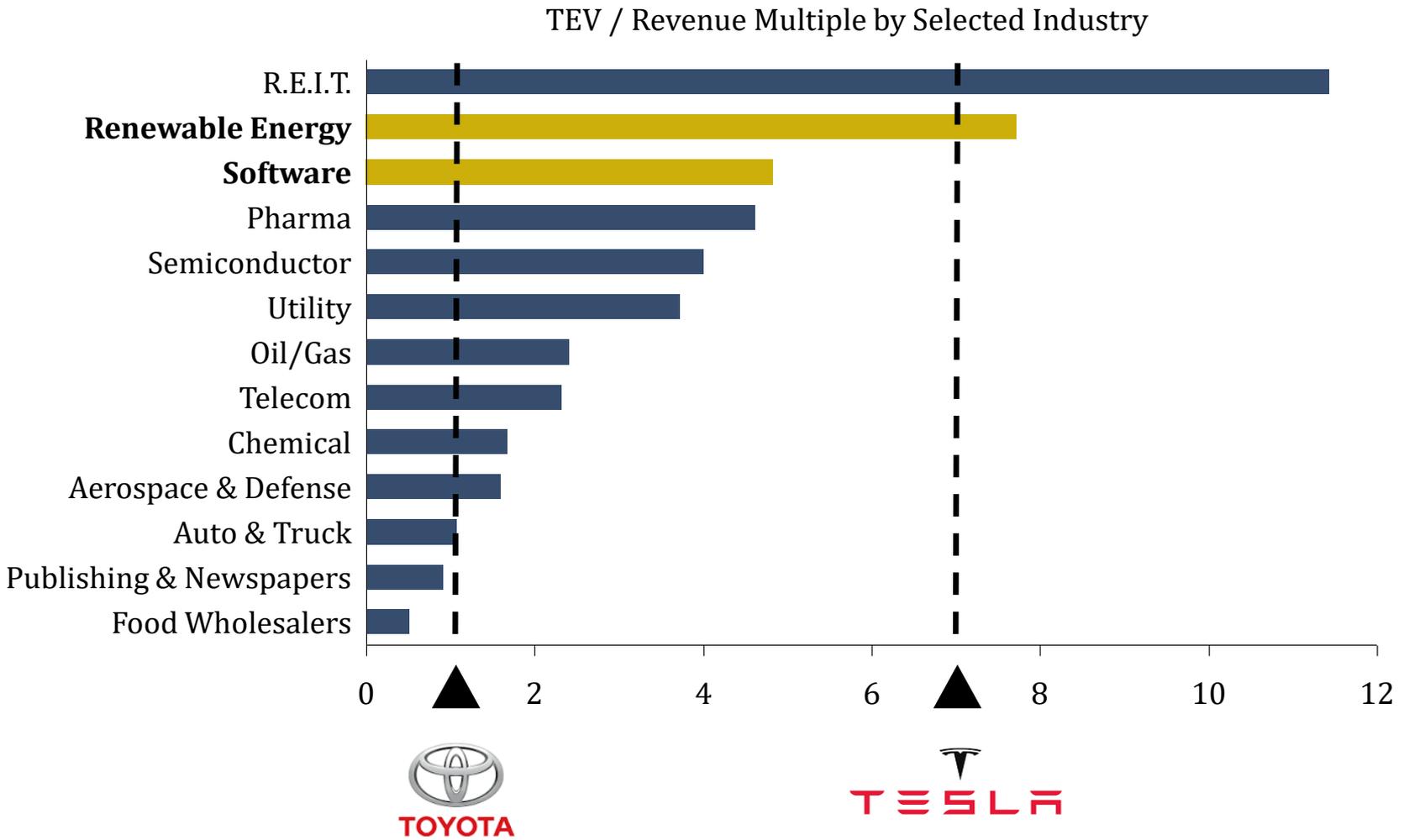
² <http://www.torquenews.com/1079/what-ideal-electric-car-range>

Still... how is it that a company like Tesla has a TEV/Revenue multiple that's 7x the industry average?

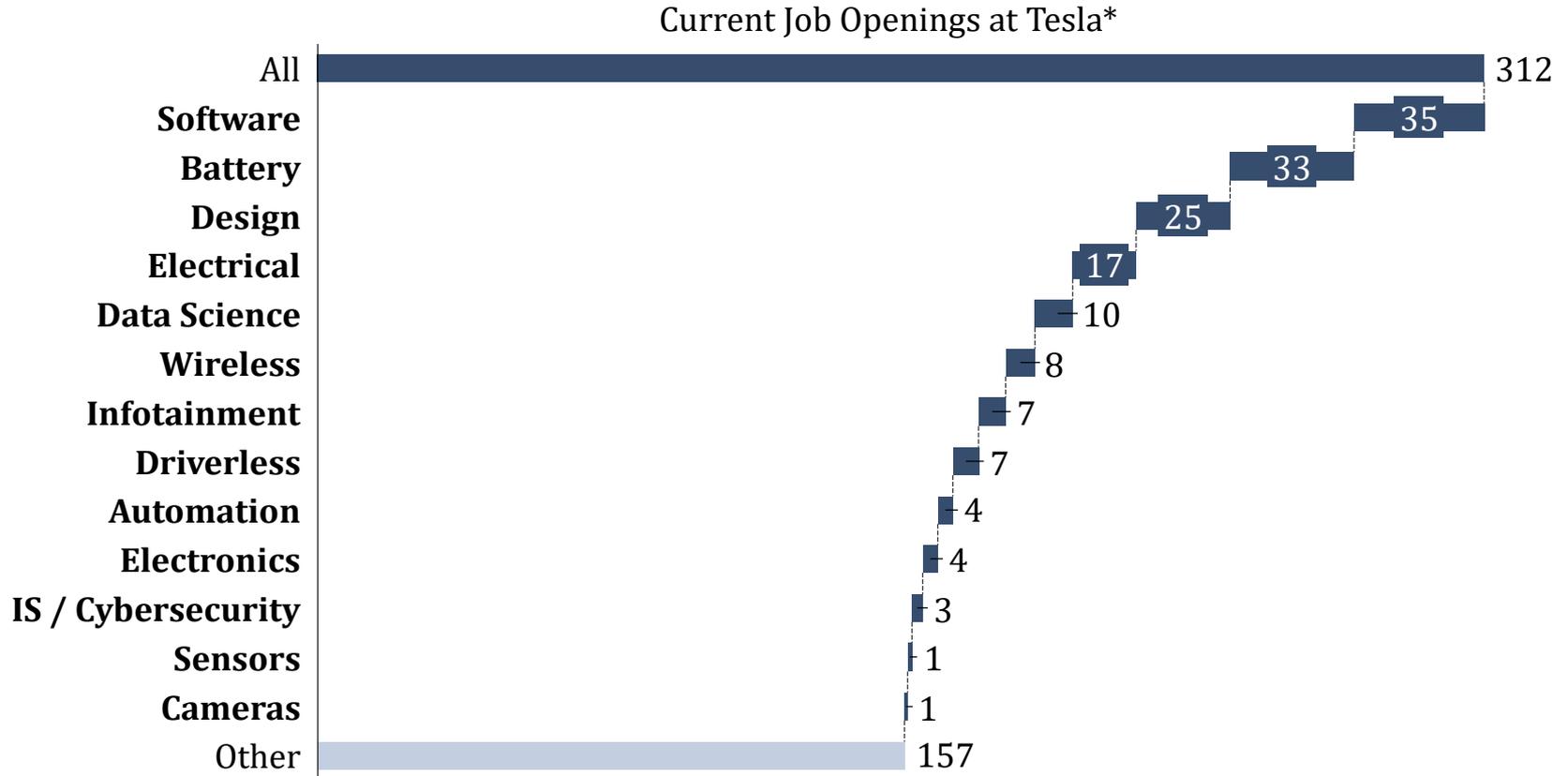
Size	Company Name	TEV (MM, USD)	LTM Revenue (MM, USD)	Employees	TEV / Employees	TEV/Revenue Multiple
1	Toyota	299,902	217,167	348,877	0.9	1.3
2	Volkswagen	206,195	196,364	607,225	0.3	0.9
3	Daimler	189,932	139,978	282,488	0.7	1.2
4	Ford	165,212	141,546	201,000	0.8	1.1
5	BMW	153,499	77,964	124,729	1.2	1.5
6	GM	117,687	156,849	225,000	0.5	0.7
7	Nissan	106,238	98,598	161,925	0.7	1.0
8	Honda	104,507	110,313	208,399	0.5	0.8
9	Hyundai	74,088	69,431	61,456	1.2	0.9
10	Renault	58,360	51,721	120,136	0.5	1.1
11	Tesla	48,945	7,000	17,782	2.8	7.0
12	SAIC	41,509	105,617	163,817	0.3	0.4
13	Tata Motors	27,377	41,750	76,598	0.4	0.6
14	Fiat Chrysler	24,793	117,194	234,499	0.1	0.2
15	BYD	22,969	14,975	196,026	0.1	1.5

Industry Average TEV/Revenue Multiple (Excluding Tesla) → 0.9

Tesla has convinced investors that it isn't a car company, but an integrated software / renewable energy company



Tesla is also hiring like a tech company



Roughly half of Tesla's current job postings are for roles that fall outside of the traditional auto engineering job description

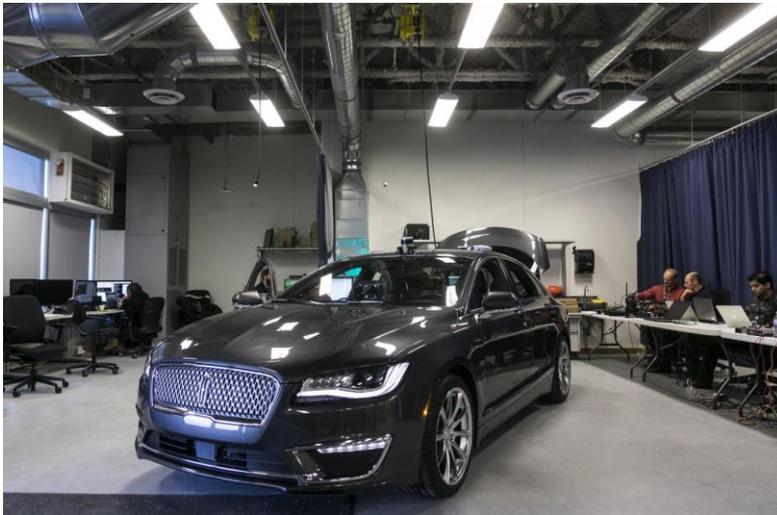
*Source: Tesla career page, as of April 4, 2017

Other companies like Ford are following suit and hiring employees from tech companies with greater expertise

BUSINESS

Ford Hires BlackBerry Employees to Work on Connected Cars

Move would help auto maker further build its computing expertise



“Ford Motor Co. is hiring 400 engineers from BlackBerry Ltd.’s mobility solutions unit to help develop internet-connected vehicles, giving a boost to the auto maker’s software development efforts as it races to keep up with traditional rivals and tech companies. The hiring of BlackBerry’s engineers **will double Ford’s mobile-connectivity team**, the company said, helping the auto maker further build its computing expertise as it pivots to new ventures that rely more on vehicle connectivity.”

-WSJ, March 30, 2017

Meanwhile, tech companies like Apple are looking for talent from the aerospace industry

TECH

Apple Taps Space Program as It Tries to Catch Up in Driverless Cars

Company's plan puts senior engineers—some with NASA experience—in self-driving vehicles for road tests

“In a permit issued April 14 by the state of California, obtained Friday through a public-records request, **Apple identifies six employees, including roboticists who worked at the U.S. National Aeronautics and Space Administration, who will be in the front seat of three Lexus sport-utility vehicles outfitted with technology to make them autonomous.**”

-WSJ, April 24, 2017



A review of some of Tesla's other winning strategies

<i>Tesla's Strategy</i>	<i>Advantages</i>	<i>Tesla Quote</i>	<i>Similar Strategy Adopters</i>
"We're more than a car company"	<ul style="list-style-type: none"> Higher PE multiple More access to funding 	"Tesla is not just an automaker, but also a technology and design company with a focus on energy innovation" – Tesla homepage	 <p>Amazon claims it's not just an online retailer; it's a publisher, computing / storage co., etc.</p>
Distinct user interface	<ul style="list-style-type: none"> Breeds brand loyalty 	"Wait until you see the real steering controls and system for the 3. It feels like a spaceship." – Elon Musk	 <p>Apple took over the smartphone market with distinctive UI, operating system, and app ecosystem</p>
Direct to consumer sales	<ul style="list-style-type: none"> Higher margins Predictable revenue 	"It is absolutely vital that we adhere to the no negotiation and no discount policy" – Elon Musk	 <p>DOLLAR SHAVE CLUB</p> <p>Dollar Shave Club avoided retail outlets and offered customers lower prices</p>
Simplified sourcing	<ul style="list-style-type: none"> Less R&D spend Easier supply chains 	"Tesla is working exclusively with Panasonic for Model 3 cells" – Elon Musk	 <p>Trader Joe's simplified its supply chain and increased stocking accuracy</p>

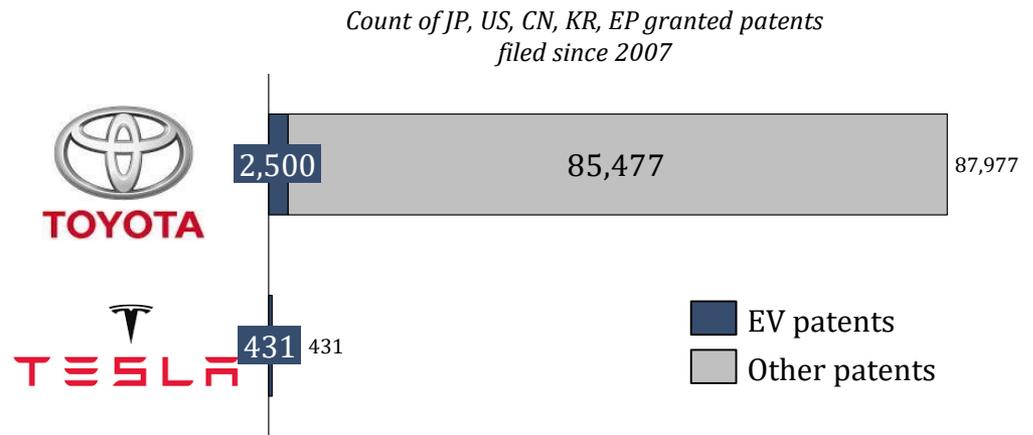
Tesla is trying to “play nice” by giving away its patents...



All Our Patent Are Belong To You

Elon Musk, CEO • June 12, 2014

“Tesla Motors was created to accelerate the advent of sustainable transport. If we clear a path to the creation of compelling electric vehicles, but then lay intellectual property landmines behind us to inhibit others, we are acting in a manner contrary to that goal. Tesla will not initiate patent lawsuits against anyone who, in good faith, wants to use our technology.”
– Elon Musk



Nokia tried this too and lost a lot of shareholder value

...but Tesla needs the technology rights to back up the Wall Street dream

Example Technology	Patent Trendline*	Top Assignees*	Tesla Patents*
<p><u>Automotive telecom</u>: used for connected car systems</p>		<p>Hyundai - 1,436 Honda - 797 Mitsubishi - 690</p>	50
<p><u>Lithium batteries</u>: used for electric vehicles</p>		<p>Samsung - 1,432 BYD - 254 LG Chem - 205</p>	22
<p><u>Car sensors</u>: technology (e.g. LiDAR, gyroscopes) used for safety and autonomous vehicles</p>		<p>Hyundai - 1,974 Bosch - 1,087 Honda - 609</p>	52

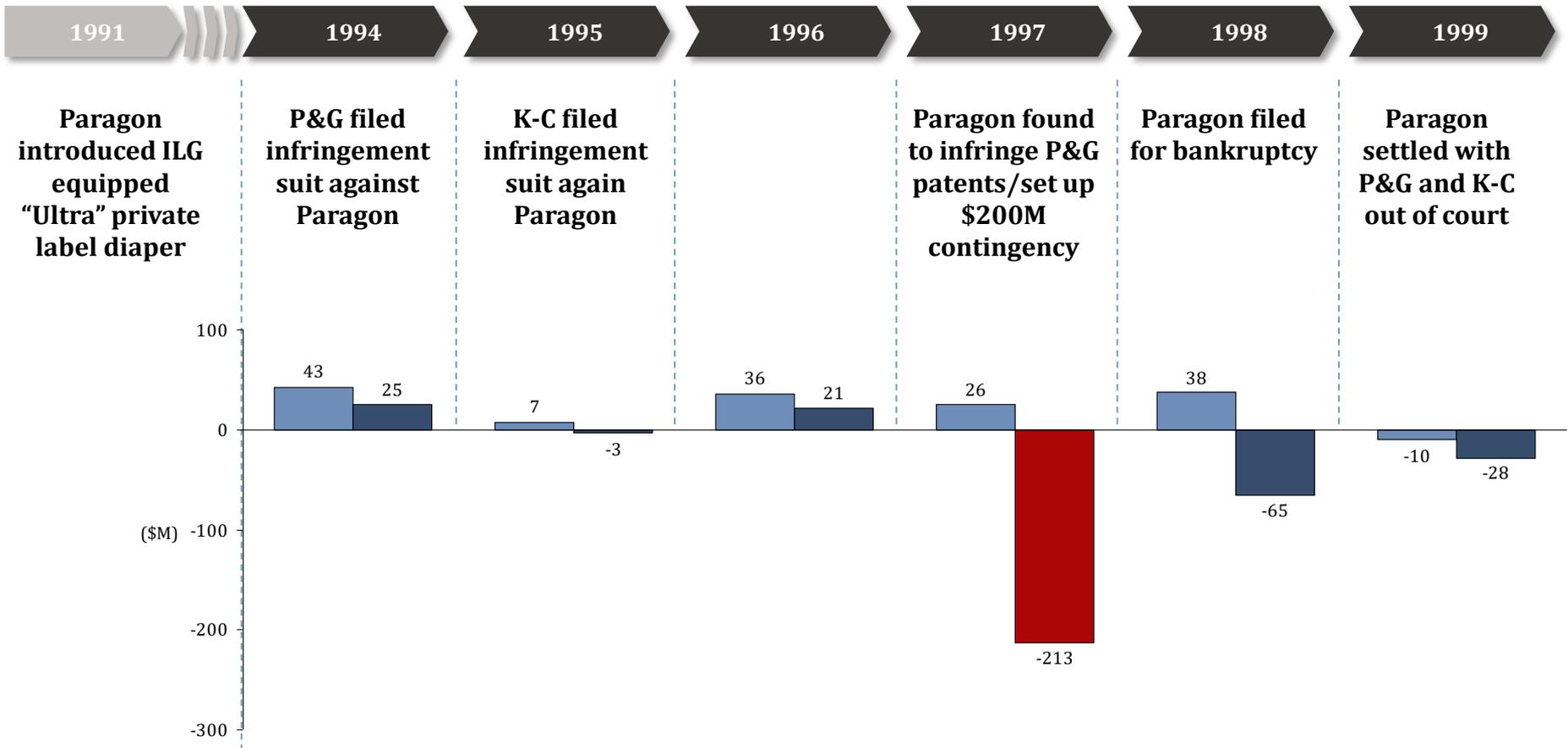
*Counts include only patent grants from US, EU, DE, CN, JP, KR filed since 1997

Source: Thomson Innovation search screens

Example of how an incumbent avoided the disrupter

Paragon Trade Brands P&L Metrics

Operating Income (\$M) Net Income (\$M)



Source: <http://chapter11cases.com/in-re-paragon-trade-brands-inc-324-br-829-bankr-court-nd-georgia-2005/>

As an auto incumbent, what's my next move?

Call to action

- Emerging OEMs like Tesla are taking the market by storm
- If they are allowed to thrive in the EV market unopposed, it will make it difficult to move in later when consumers switch from internal combustion engine vehicles to EVs
- The time to act is now; emerging OEMs are most exposed in their infancy



Action agenda

- OEMs: acquire and file patents on key feature differentiators for your brand; leverage suppliers to maintain the lowest cost of goods sold for yourself; don't let emerging EVs go unopposed
- Suppliers: use your tech position to ensure ubiquitous adoption of your technologies

As an emerging auto, what's my next move?

Call to action

- P&G and Kimberly Clark showed that incumbents can use their patents to force new entrants out of the market
- Auto incumbents will be able to dip into your profit margins if you don't start building up strong IP positions
- Don't assume that they won't use their IP to disrupt your business and attempt to keep you out of the market



Action agenda

- Make sure you're aggressively filing patents in chokepoint areas
 - The technologies that you file on need to be thought through carefully
 - Your filings need to be in the appropriate jurisdictions around the world
- Acquire substantial patent portfolios from others in the industry
 - It's going to be hard to level the playing field just by filing your own patents, so you should be proactively buying assets
- Once your IP position is more equal to that of auto incumbents and their suppliers, cut balanced and favorable deals with them
 - Form partnerships with better terms
 - Negotiate favorable cross-licensing deals

Part 4: China is booming, but Chinese autos are geographically restricted

Auto and tech are converging

- 1 Tech companies have deep pockets and will be disruptive; Silicon Valley thinks differently than the auto industry

Disruption of the auto business model

- 2 The car is becoming both a multi-functional device and service platform; this happened in the smartphone industry 10 years ago, and many incumbents fell (e.g. Nokia, RIM)

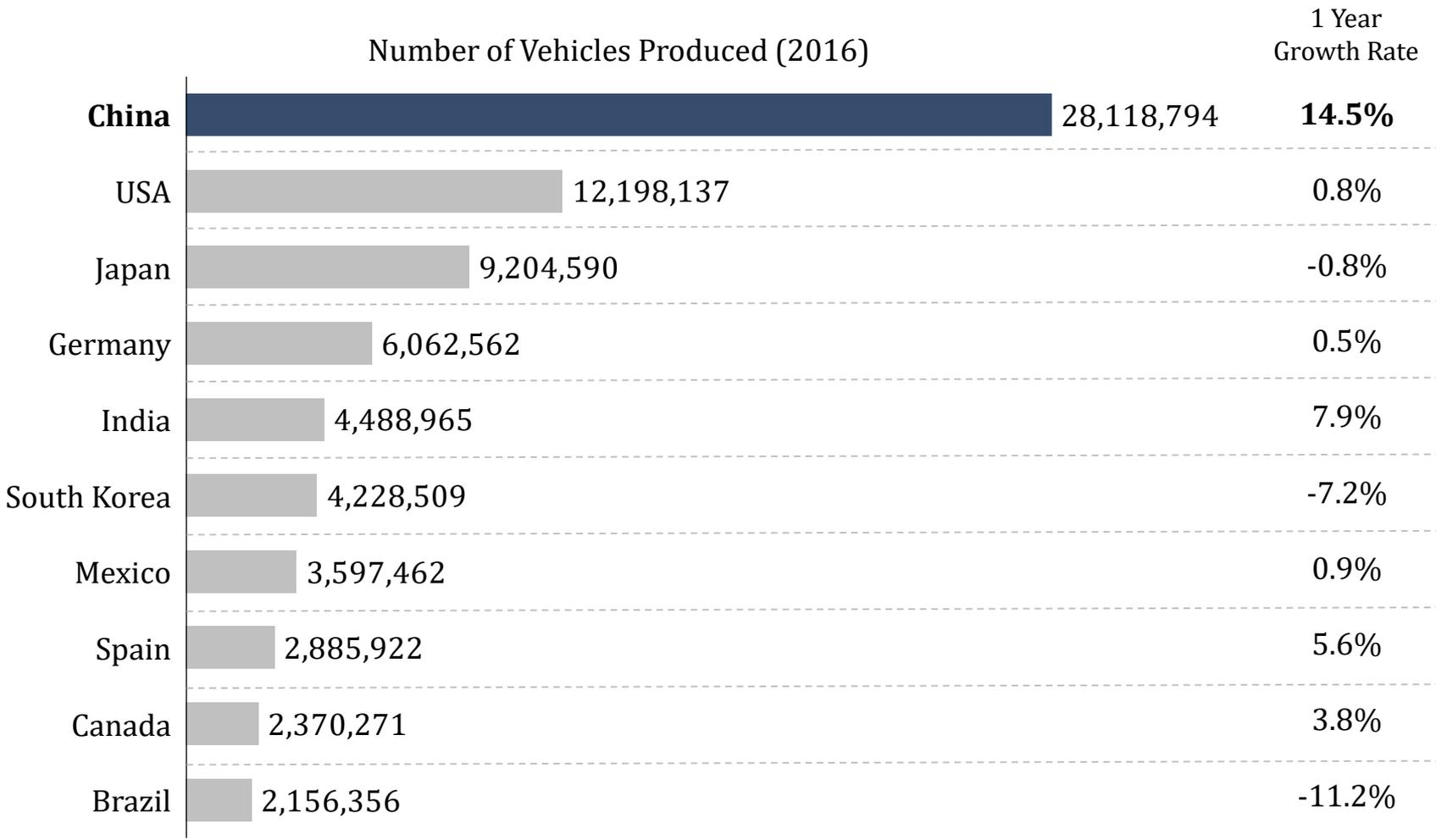
Disruptors are benefiting from the evolving automotive value and supply chains

- 3 Tier 1 and 2 suppliers own significant design and manufacturing capabilities, enabling disruptors to more freely enter the field; this is leading to new market dynamics and profit pools

The auto industry in China is booming, but...

- 4 Chinese autos looking to expand internationally into profitable markets will need to have the appropriate technology rights and strategies

China has become a vehicle production powerhouse and shows no sign of stopping



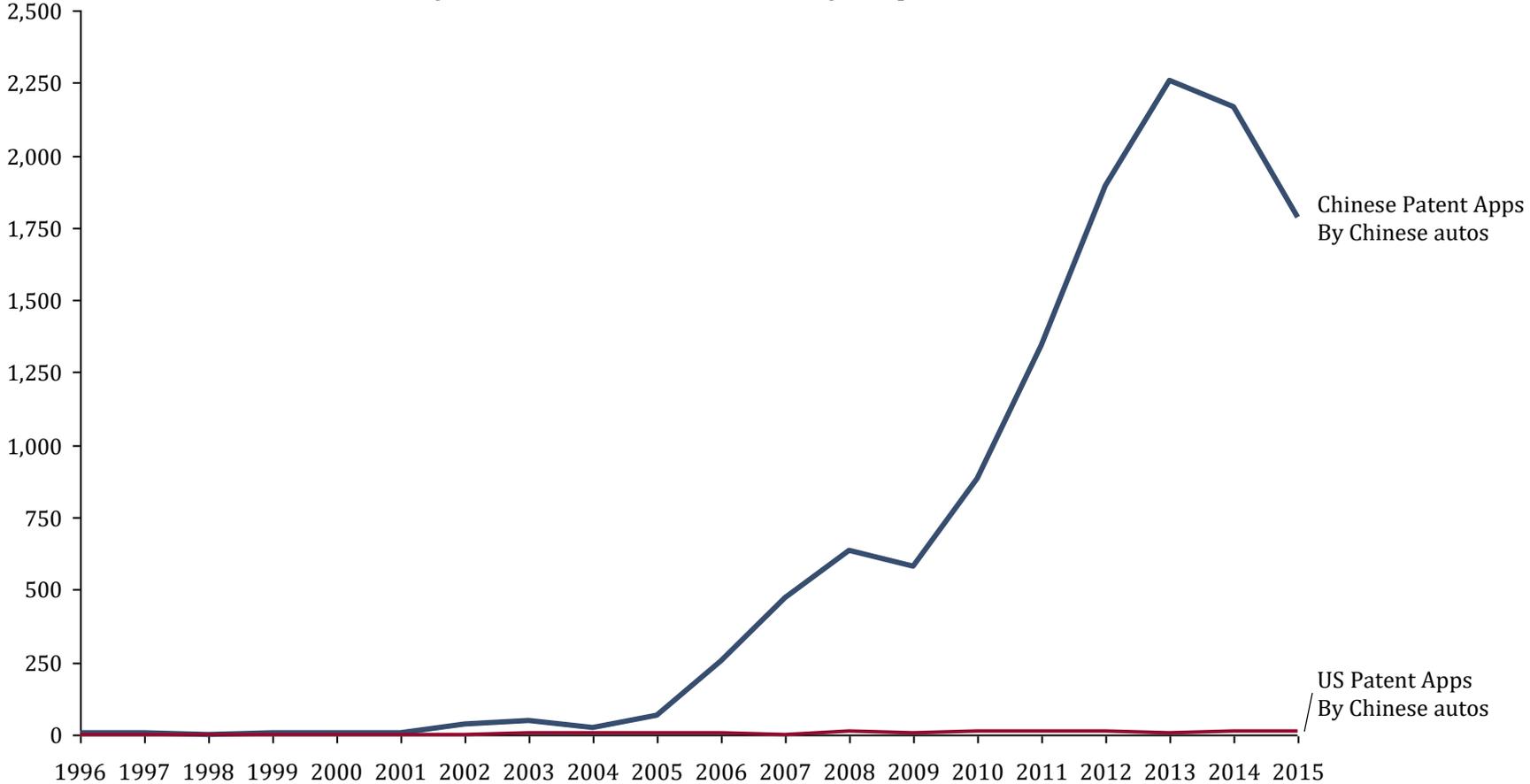
The Chinese government is doing everything it can to make sure the Chinese autos stay on top

Chinese Government Auto Strategy	Description	End Goal
Forced Joint Ventures	The government gives open market access to foreign automakers in exchange for technology transfer through a 50:50 equity joint venture structure	Breed Chinese innovation
Aggressive Enforcement	China's National Development and Reform Commission (NDRC) has levied fines on foreign auto part makers for alleged collusion to fix prices and other alleged monopolistic behavior	Protect Chinese autos
Distribution Rules	China has reduced foreign automakers' control over their authorized distribution channels	Reduction of foreign imports

China is booming

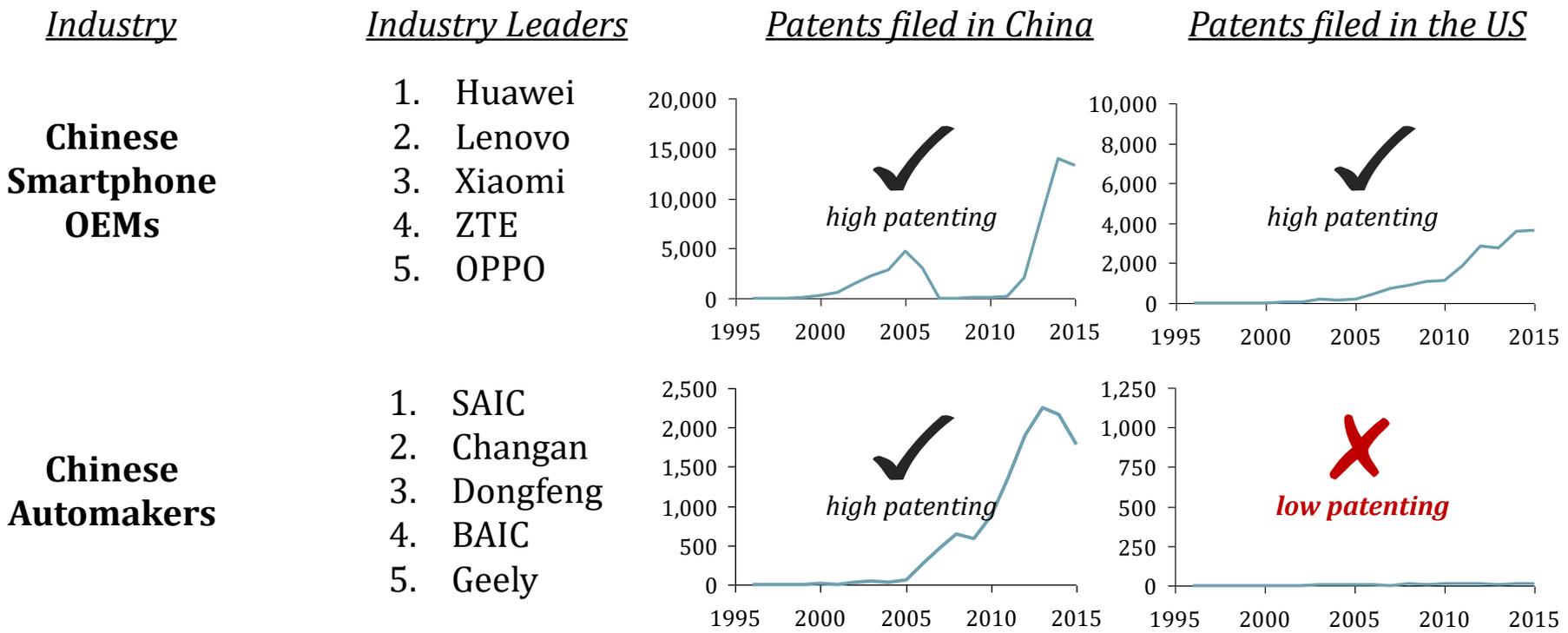
Just one thing... Chinese autos lack the patent protection to expand into new geographies

Patents filed in China vs. the US by Top Chinese Autos



*Includes SAIC, Changan, Dongfeng, BAIC, and Geely
Source: Thomson Innovation, CN and US Applications, 1996-2015

Chinese automakers should follow what the Chinese smartphone players are doing



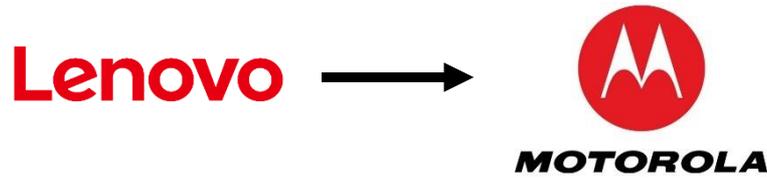
Chinese automakers needs to start acquiring and filing more US patents; they risk being targets to players with more established US portfolios

International expansion requires the right patent protection; just ask Xiaomi, an emerging Chinese smartphone maker



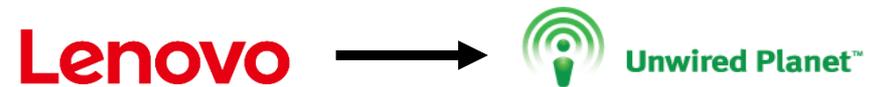
Sources: <http://betanews.com/2014/12/11/xiaomi-infringes-ericsson-patents-in-india-local-court-bans-sales-until-february-2015/>;
<http://www.scmp.com/tech/enterprises/article/1889024/chinas-xiaomi-slapped-patent-infringement-suit-blue-spike-us-over>

Chinese-based Lenovo also understood the need for patents when it entered the smartphone market



Motorola Mobility Acquisition

- On January 29, 2014, Lenovo acquired Motorola Mobility from Google
- \$2.91B deal
- Google maintains ownership of majority of the Motorola Mobility patent portfolio, but Lenovo receives a license to all IP
- Lenovo also receives over 2,000 patents from the deal



Unwired Planet Patent Acquisition

- On March 21, 2014, Lenovo acquired a wireless patent portfolio from Unwired Planet
- \$100M deal
- Deal consists of 21 patent families related to 3G and LTE
- Lenovo also gets license to Unwired Planet's full portfolio of 2,500 issued and pending patents

But it's not just about acquiring patent assets, it's also about the associated cross-licenses – Lenovo gets it



- In 2004, Lenovo purchased IBM's PC group for \$1.75B
- In order to effectively expand out of China, Lenovo needed IP protection in the geographies it was expanding into
- IBM had already established cross-licenses with the major PC competitors, enabling Lenovo to operate freely in the space after the acquisition

By acquiring the cross-licenses that IBM had already established with PC competitors, Lenovo was able to enter the market with less concern about being sued

Attention non-Chinese autos: you need to stock up on Chinese patents too... the enforcement environment is strong

Advantages

Evidence

1

Specialized, low-cost, and fast courts

- **<10% the cost of US litigation**
- Specialized IP courts
- Judges use technical advisors
- Short time from filing to trial (<1 year)

2

Increasingly advantageous for patentees

- **High win rate (up to 75%)**
- Foreign patentees win more than domestic patentees
- Validity challenges rarer than in the US and often not completed until after judgement and injunction are issued

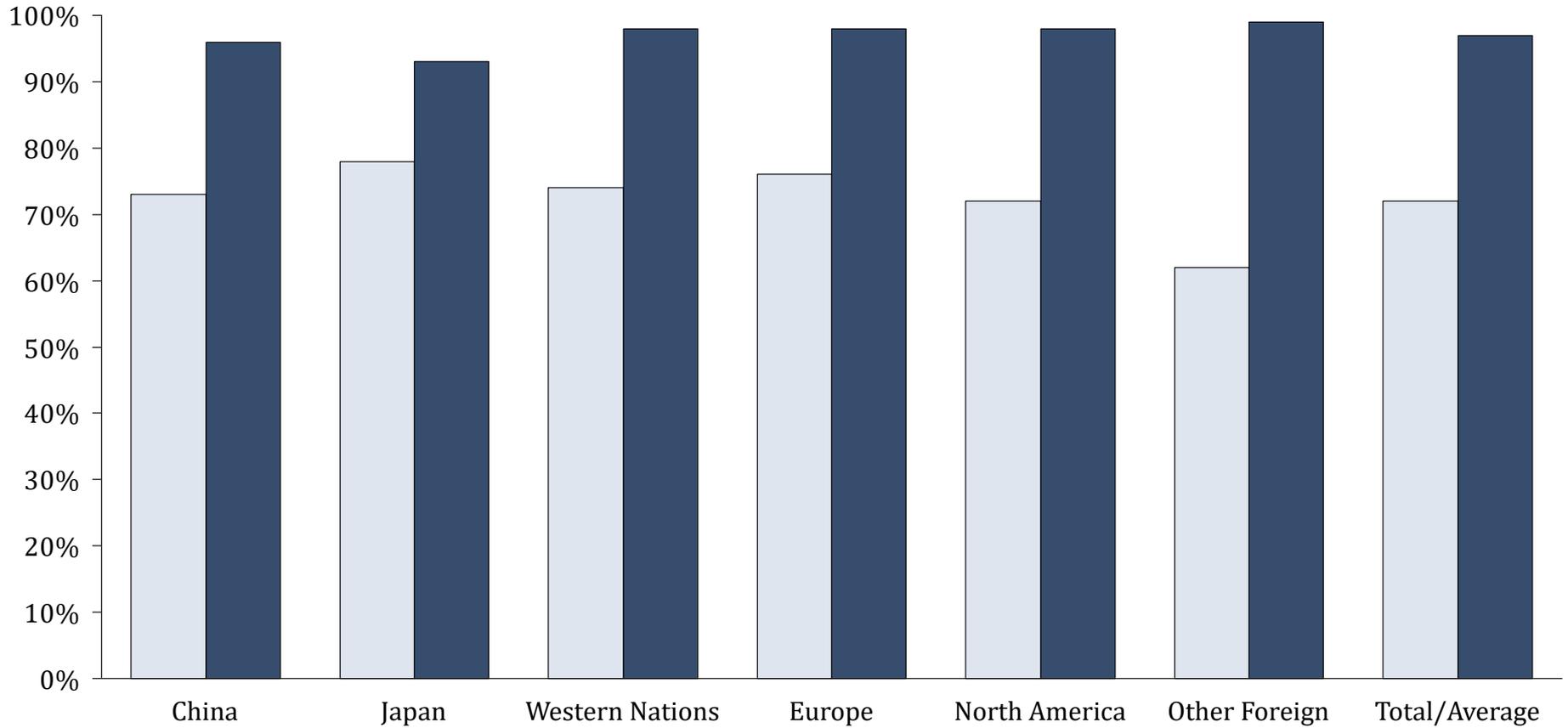
3

Injunctions are awarded

- **Injunctions are virtually guaranteed (95%)**
- A litigation win can effectively hamper an infringer's sales around the world because what is not sold in China is often made there

Patent holders of all nations are winning injunctions in China

Patent holder success/injunction rates in Chinese courts*



*when defendant is a Chinese company
 Source: Erick Robinson Law360 article "China Increasing Patent Rights As US Goes The Other Way", October 22, 2015

Win Rate for Patent Holders as Plaintiffs
 Injunction Rate for Winning Patent Holders

Other industries have noticed and are filing IP suits Exemplary lawsuits filed in China by non-Chinese companies

Selected Smartphone Cases Filed in China in 2016

QUALCOMM **MEIZU**

Qualcomm filed a complaint against Chinese smartphone maker Meizu for IP infringement. The two companies eventually reached a settlement agreement.

June 2016

SAMSUNG **HUAWEI**

Samsung and Hauwei have both filed suit against one another in China claiming patent infringement. **Huawei was recently awarded \$11.6M in damages.**

July 2016

WiLAN **SONY**

WiLAN sued Sony in China for patent infringement and is currently seeking an injunction against Sony that would prevent it from selling LTE-standard smartphones.

November 2016

Sources:

- [https://www.wsj.com/articles/qualcomm-chinese-smartphone-maker-meizu-settle-patent-dispute-1483084815;](https://www.wsj.com/articles/qualcomm-chinese-smartphone-maker-meizu-settle-patent-dispute-1483084815)
- <https://www.wsj.com/articles/samsung-sues-huawei-over-patent-infringement-1469153204;>
- <https://www.ft.com/content/f7e8690a-a3e8-11e6-8b69-02899e8bd9d1>

New markets to consider: will other Asian nations become new important IP battlegrounds as labor moves there?

Vietnam



- Vietnam is increasingly becoming a top outsourcing location as Chinese labor costs rise
- The Vietnamese government has been heavily involved in encouraging Vietnam's growth as an outsourcing destination

Indonesia



- Indonesia is a strong candidate to take up Asian manufacturing with Chinese labor costs rising
- Large population (250 million)
- Less political strife and uncertainty than Vietnam and Thailand

Thailand



- The Thai government is making strides to go after more "high value" manufacturing
- Foreign direct investment in Thailand is growing

Automotive players should be looking at tech-rich companies in Japan

Top 10 Countries by Patent Application Volume (2015)

Offices	Applications
China	1,101,864
United States of America	589,410
Japan	318,721
Republic of Korea	213,694
European Patent Office	160,028
Germany	66,893
India	45,658
Russian Federation	45,517
Canada	36,964
Brazil	30,219

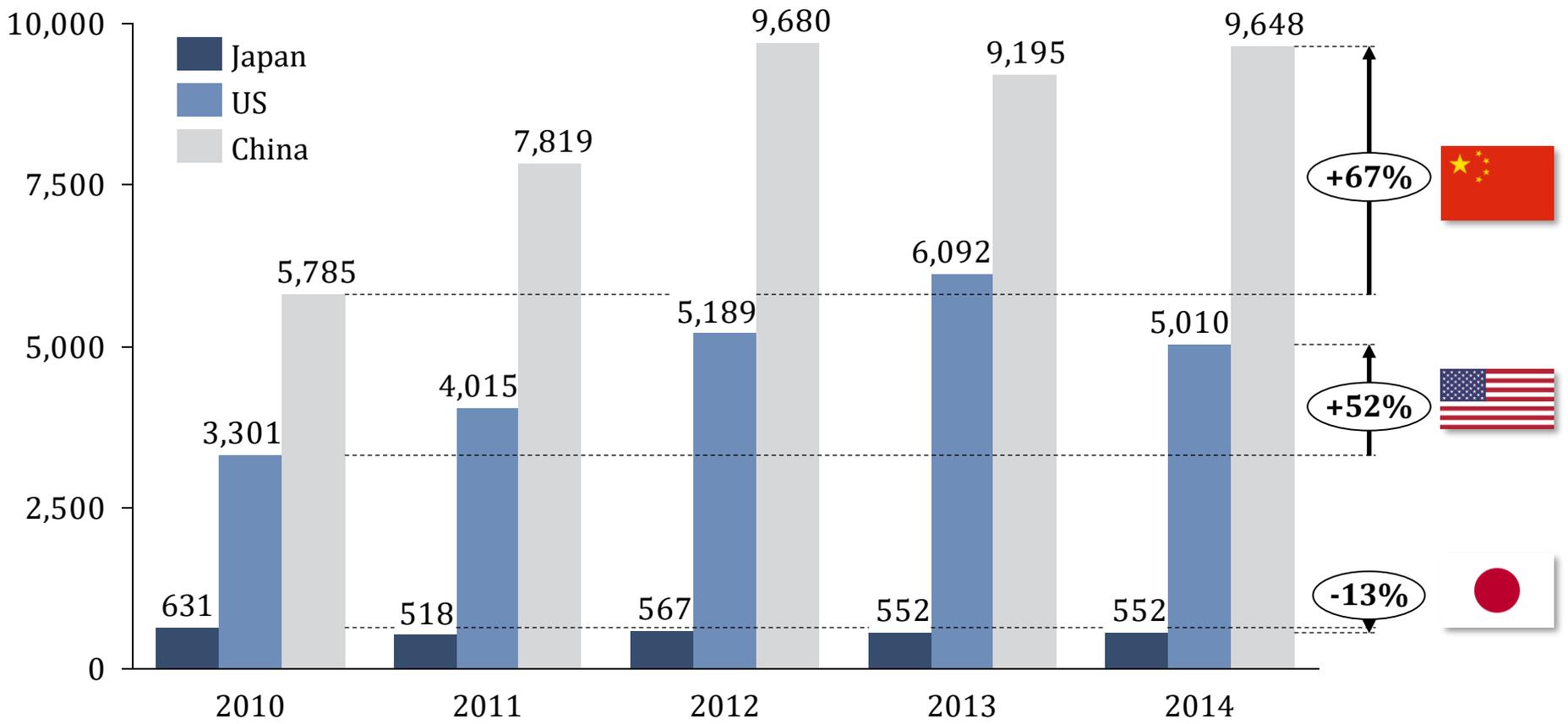
Top 10 Japanese Patent Filers (2015)

Applicant	Filings
Mitsubishi Electric	1,593
Sony	1,381
Toyota	1,214
Panasonic	1,185
Hitachi	1,165
Sharp	1,073
Fuji Film	947
NEC Corp.	895
Denso	704
Murata	658

Source: WIPO (2015 data)

Japanese companies have patents but they're rarely enforced; outsiders should jump in and make acquisitions

Number of IP-Related Lawsuits in Japan, the US, and China



Source: <http://www.iam-media.com/magazine/issue/81/Features/Japan-debates-the-way-ahead-for-patents>

Should automotive players consider Foxconn's strategy?

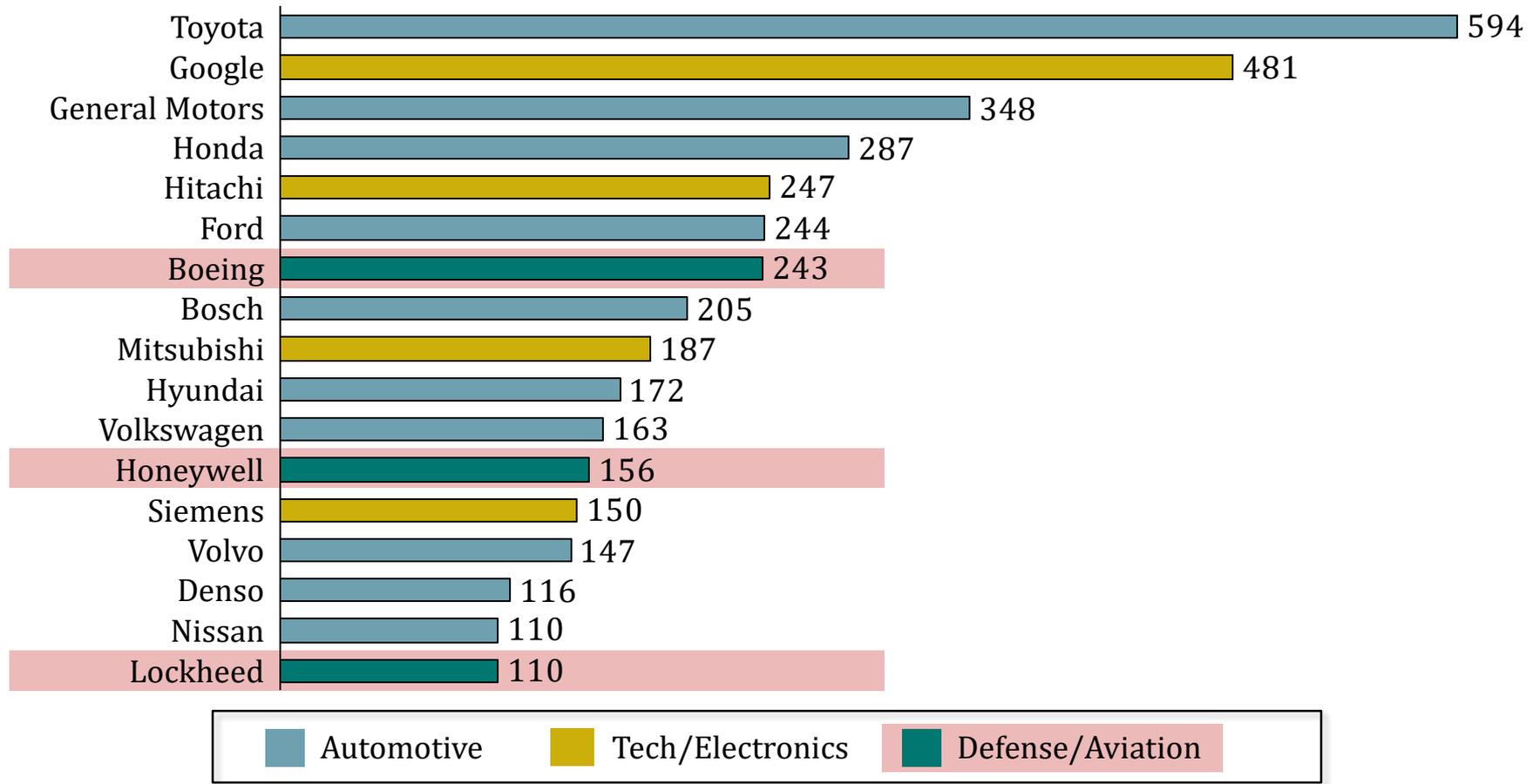


- In 2016, Foxconn purchased Sharp for \$3.5B
- In order to maintain Apple as a client, Foxconn needed IP around OLED technology
- OLED technology was already being used by Samsung in its smartphones, and Apple signaled it would make a similar jump

Foxconn needed OLED technology and the freedom to operate in Japan to protect its relationship with Apple

Don't forget about orthogonal industries with relevant IP Example: defense companies are working on autonomous vehicles

Self-driving/Autonomous Vehicle Patent Holdings (US, EP, KR, CN, JP grants and applications)



Search using Thomson Innovation: Title/Abstract/Claims field text contains: (autonomous OR self-driving OR "self driving" OR driverless) AND (vehicle OR vehicles OR car OR cars OR automobile OR automobiles), priority year 1997 or later. US, EP, KR, CN, JP apps and grants. Returned 17,516 distinct application numbers. Exemplary companies shown above

As an emerging Chinese auto, what's my next move?

Call to action

- If you intend to expand into new geographies, expect to face an uphill battle unless you secure the right IP
- You're gaining market share, but sooner or later companies will start forcing you to sign license agreements and cut into your profits
- China's patent system is getting stronger and new technology entrants will use that against you



Action agenda

- Think globally
 - Acquire technology rights and enter cross licenses to enable cross-boarder expansion without friction (follow Xiaomi's lead); in particular, secure protection in the US, Europe, and emerging Asian countries that are increasing their manufacturing prowess (e.g., Vietnam, Indonesia, and Thailand)
- Invest in and set up worldwide standards bodies

As a non-Chinese auto player, what's my next move?

Call to action

- Chinese autos are picking up steam and pose a threat to your long-term market dominance
- They could develop strong IP positions in China and even outside of China
- But they don't have much IP now



Action agenda

- Leverage your existing IP position
 - Strike licensing deals with Chinese autos so you can profit as they grow
 - Consider selling non-core IP assets to emerging players that might be allies
- Buy patents before your Chinese competitors do – don't allow them to level the playing field
 - Proactively seek out assets and maintain your IP edge over the new entrants

Evaluating our predictions from last year

The trends we foresaw last year persist in today's market

What we said in our 2016 report

1

Technology ownership battles

Whether incumbent auto companies want it or not, auto patent conflict is almost certainly ahead – impacting product launches and profit pools

2

Rise of non-practicing entity (“NPE”) litigation

Plan on getting sued by NPEs for patent infringement, but in the current environment it isn't quite as scary as you might think

3

Development of new technology standards

Standards and the associated patent pools will become even more critical, and if you don't handle them properly you may lose your competitive advantage

4

Emergence of China

Chinese companies are emerging in automotive, but they will struggle to enter Western markets if they don't acquire IP rights in the necessary geographies

What we've seen since

- Tech and automotive have begun to converge further (e.g. Samsung acquiring Harman, Intel acquiring Mobileye, Qualcomm acquiring NXP, Ford hiring Blackberry employees, etc.)
- IP litigation between major players has begun (e.g. Waymo suing Uber, etc.)
- NPEs are starting to do battle with major autos in the ITC (e.g. Intellectual Ventures)
- While there has been continued NPE activity, to date NPEs have struggled to extract big dollars from auto players
- There continue to be new standards related to emerging automotive technologies (e.g. Ericsson starting the Avanci pool)
- Cybersecurity is a particular concern following recent security breaches (e.g. the Tesla hack)
- Chinese tech players are taking an interest in US autos (e.g. Tencent bought a 5% stake in Tesla)
- Chinese automakers have nearly 20% of the US market but are not patenting in the US; they could learn from Chinese smartphone players who have been building large IP war chests (e.g. Xiaomi bought patents from Intel, Casio, and Microsoft)

About Sherpa Technology Group

Introduction to STG: Leadership Team

Kevin Rivette, JD

Founding Partner
Founded STG in 2008

- Former Vice President (IP Strategy) at IBM and former Chairman of the USPTO oversight committee
- Former board member at Tessera (Nasdaq: TSRA) and SRC Computers; current board member of MiMedia
- Former senior advisor to BCG on IP matters; founder/CEO of Aurigin Systems, an IP analytics software firm
- Media expert in IP for Bloomberg TV, The New York Times, Businessweek, and others
- Named to the National Law Journal's inaugural list of IP "Trailblazers and Pioneers" in 2014
- Named to IP Hall of Fame in 2007; author: Rembrandts in the Attic; registered patent attorney

Ralph Eckardt, MBA

Founding Partner
Founded STG in 2008

- Launched and led BCG's IP Strategy practice
- Included on IAM's list of World's Leading IP Strategists since its inception
- Extensive experience in technology and IP strategy projects across a wide variety of technologies and markets
- Author of *The Invisible Edge* – Awarded Best Strategy Book of 2009
- Principal inventor, N-Compass IP analysis tool
- MBA, MIT Sloan School of Management, Former CPA, 18+ yrs professional service experience

Peter Detkin, JD

Senior Advisor
Joined STG in 2016

- Named the second most influential "IP market maker" in the world by IAM Magazine
- Founded Intellectual Ventures, a multi-billion dollar patent/innovation investment fund with 40,000+ patents
- Former Vice President and Assistant General Counsel at Intel Corporation – patent and licensing departments
- Former Partner at the law firm of Wilson, Sonsini, Goodrich and Rosati
- BSEE and JD, University of Pennsylvania

Andy Filler, JD

Partner and General Counsel
Joined STG in 2014

- Voted #2 corporate IP attorney in Silicon Valley in 2011 by the Silicon Valley Business Journal
- Current member of the Board of Governors at the University of San Francisco Law School
- Formerly General Counsel and VP of IP at Nanosys, Inc.; Chief IP counsel at Caliper Technologies
- Senior Associate at Weil, Gotshal & Manges
- BS Mech. Engineering from Cornell; JD, *magna cum laude*, University of San Francisco Law School

Mark Gober

Senior Director
Joined STG in 2010

- UBS Investment Bank, Financial Institutions Group in New York: M&A, capital raising, and restructuring
- STG focus areas: technology monetization strategies, patent transactions, and publicly-traded IP companies
- Quoted in Bloomberg Business and *The Patent Investor* (a subscription newsletter) on tech/IP matters
- Author of Intellectual Asset Magazine's feature article "PIPICO investing in a brave new world" (Dec. 2015)
- B.A., Princeton University, *magna cum laude*; Princeton varsity tennis captain

What we do: strategy and M&A for technology and IP

Strategy

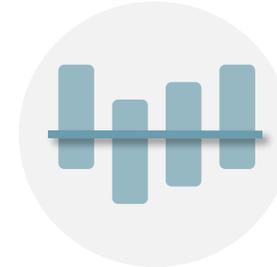
M&A

Technology strategy



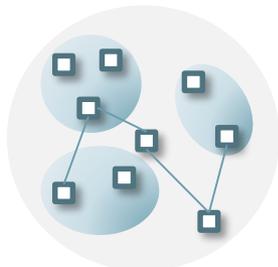
Competitive Landscaping
Technology Assessment
Partnership Analysis

Transaction execution



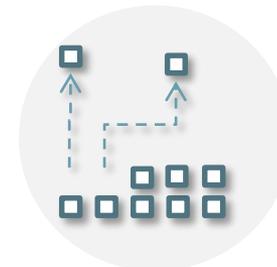
Divestitures
Acquisition Programs
Licensing

IP strategy



Monetization Strategy
Corporate-level IP Strategy
IP Portfolio Development

Transaction support



Due Diligence
Valuation
IR/PR Support

We work with companies of all sizes

Example client profiles

Fortune 500 companies
(technology-driven businesses, not just “high tech”)

Typical Challenges Faced by STG clients

- How can we use our technology and IP to grow/improve the economics of our product businesses?
- How should we prioritize our investments in technology and IP development?
- What is the value of our core and non-core technology and IP assets?
- What is the best way to realize value from those assets? Should we consider standards bodies?
- What should we do if we are entering a new market and incumbents have IP?

Emerging technology companies
(e.g., venture-backed start-ups)

- How can we use our technology & IP to improve the probability and profitability of an exit/IPO?
- How can we leverage our technology and IP assets to improve deal terms?
- What is our long-term IP strategy? How do we deal with standards bodies?
- How should we prioritize business development and partnership opportunities?
- How should we allocate our scarce resources on technology & IP investments?

IP licensing companies
(product businesses and NPEs)

- How can we use our IP to create a forcing mechanism to close licensing deals?
- What is our monetization strategy and how will we grow the licensing business?
- What technology sectors should we be targeting for acquisitions?
- What assets should we buy and how should we structure those deals?
- How should we structure our organization and prioritize investments?

Investors
(venture capital, private equity, hedge funds, patent litigation funds, etc.)

- How should we value technology and IP when considering an acquisition?
- Is our investment target’s technology truly advantaged?
- How well does our investment target’s IP protect its competitive differentiation?
- Can we monetize the IP held by a struggling portfolio company?

Investment banks
(bulge bracket or boutique)

- How should we assess the value of technology and IP assets in an M&A transaction?
- How much of the value of the company should we attribute to its technology & IP?
- What is the best way to communicate the value of a company’s IP to third-parties?
- Why would a company’s IP matter to a buyer or investor?
- How should we structure a deal to preserve/maximize the value of the IP?
- What does a technology and IP diligence process entail?

What differentiates us

1. OUR DEEP EXPERTISE

We have world-class experience in IP strategy, management consulting, investment banking, and engineering. We are led by thought leaders who managed and monetized some of the world's leading patent estates at IBM Corporation, Intel Corporation, and Intellectual Ventures and by strategists who ran The Boston Consulting Group's IP Strategy practice. We wrote the book(s) on IP strategy: Rembrandts in the Attic (2000) and The Invisible Edge (2009).

2. OUR MULTIFACETED APPROACH TO STRATEGY

Our decades of experience at the intersection of business, technology, and IP provides a uniquely holistic perspective. We help you succeed where other advisors cannot: unlike most law-focused IP firms we are business strategists; unlike most investment banks we dive deeply into the nuances of technology and intellectual property; and unlike most consulting firms we are data-driven and have deep experience developing winning strategies and executing transactions.

3. OUR ADAPTIVE APPROACH

Our clients' needs come in different forms, and we adjust as required. Whether the assignment is to quickly evaluate the strength of technology assets for a potential acquisition, or if we are asked to build and execute a multi-year strategy, we are equipped to handle the task. We are flexible enough to work with businesses of any size: from the nimble startup with IPO aspirations, to the global market leader looking to better leverage its technological innovations. We have the expertise and flexibility to assist our clients in whatever circumstances present themselves.

4. OUR CLIENTS WIN

Our data-driven approach and our team's skills and experiences help our clients succeed. Whatever their goal – small or large, short- or long-term – we are the sherpa who stands alongside clients all the way to success.

Additional STG team members

Calvin Wong
Director

Calvin joined STG in 2011 as an Associate in the Silicon Valley office. Previously, he was a Staff Engineer at Broadcom Corporation where he focused on IC (integrated circuit) packaging and system thermal design. Calvin attended UC Irvine where he was a member of Tau Beta Pi, and graduated with a double major in Mechanical Engineering and Materials Science Engineering.

Michael Poppler
Director

Michael is a Director in STG's Boston office and has extensive technology strategy, due diligence, and IP transaction experience. Previously, Michael worked at a hedge fund focused on investing in publicly-traded technology companies. Earlier in his career, Michael worked at a litigation strategy firm where he developed financial and economic models related to intellectual property infringement, licensing, and valuation. Michael graduated with a double major from Dartmouth College, where he captained the Men's Varsity Track and Field team.

Colin Santangelo
Associate

Colin joined STG in 2013 as an Analyst in the Boston office. Previously, he worked as a consultant at Endeavour Partners, a boutique consulting firm specializing in telecoms and the mobile ecosystem, and as an engineer at tool, inc., a product design firm. Colin graduated from Harvard University with a B.S. in Mechanical Engineering and Materials Science. He was a four-year skipper on the Harvard Sailing Team, as well as co-chair of Leverett House.

Kaitlin Maier
Analyst

Kaitlin joined STG in 2015 as an Analyst in the Boston office. Kaitlin earned a BA in Engineering Sciences from Dartmouth College and a BE in Mechanical Engineering from Dartmouth's Thayer School of Engineering. Previously, she interned as a Product Engineer at Casper, a mattress startup company, and as a Markets Analyst at Royal Bank of Scotland. In college, she worked on human-centered design projects in the women's health field.

Matt Mahoney
Analyst

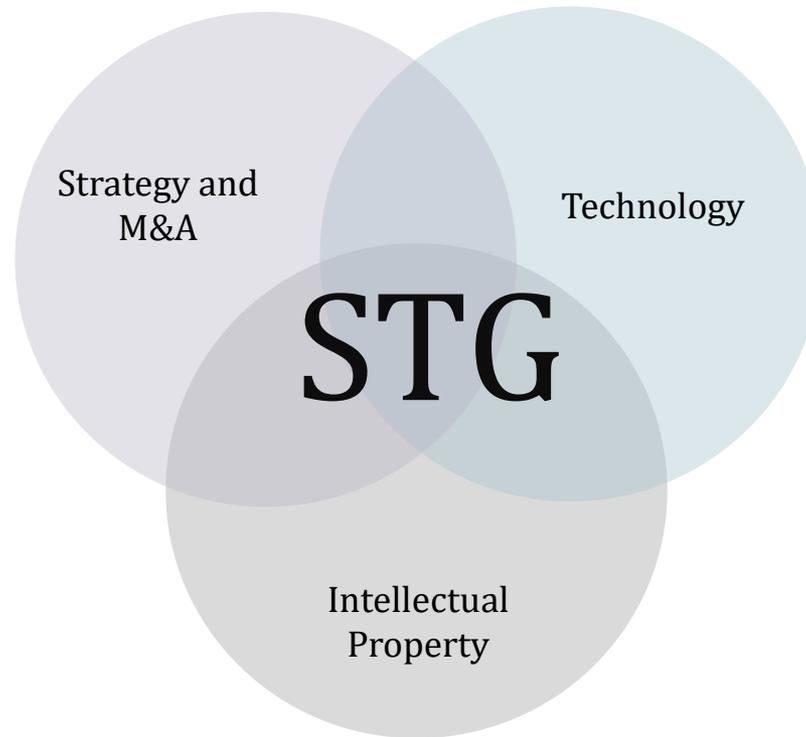
Matt joined STG as an Analyst in the Silicon Valley office. He graduated from Dartmouth College as an Economics major and Government minor with concentrations in finance and law. Matt previously interned at the University of Virginia Investment Management Company, where he worked on analysis for investment decision-making and risk management. At Dartmouth, Matt was also the captain of the club soccer and club basketball teams.

Kevin Mills
Analyst

Kevin joined Sherpa Technology Group in 2017 as an Analyst in the Silicon Valley office. Prior to joining Sherpa, he worked as an associate in the Foundations and Endowments practice at Cambridge Associates, a leading investment management and advisory firm. Kevin graduated *magna cum laude* from Princeton University with an AB in Economics and a concentration in Finance, and was a member of the varsity ice hockey team.

Worth Smith
Operations Manager

Worth graduated from Washington and Lee University with a BS in Business Administration with Special Attainments in Commerce and a Creative Writing minor. Previously, he interned with the Unreasonable Institute, a social enterprise accelerator, and with FairWinds Partners, a domain name strategy consultancy. In college, he was the president and scrumhalf of the rugby club.



Strategy and M&A for Technology and IP

Silicon Valley | Boston

www.SherpaTechnologyGroup.com

Email: Automotive@Sherpatg.com

Telephone: (617) 248-0030