Silicon Valley D-Lab Project

- Mobility Innovation -

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v1.3

This presentation represents the views of Silicon Valley D-Lab, compiled through interviews with various experts and based on diverse surveys and data.

Our work is purely voluntary and is unrelated to any corporate activities in any way. Our purpose is not to criticize specific enterprises, but to bring to light certain threats the industry may be facing if the wave of rapidly accelerating trends continue advancing forward. We hope the information serves as an aid to understanding the essence of what is occurring, and to help provide businesses with the ability to get a head start in seizing the next opportunity.

Silicon Valley D-Lab Team

This report was issued on Mar 2017
so based on information at that time.

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1. What has occurred in the Japanese manufacturing industry

Many Japanese manufacturing firms have been forced to withdraw, go bankrupt, or sellout over the past several years, in sectors that have been considered to be Japan's area of specialty.

	Past	Present
TV	 Sony/Panasonic/Toshiba/Hitachi/…	Rise of content businesses **NETFLIX** **Apple** **AMAZON**
Cell phone	 Sony/Sharp/NEC/Panasonic/SANYO…	Major IT companies become platform providers **Apple** **Google** 
Audio	  Sony/Panasonic/Aiwa/Kenwood…	Value shifts from hardware to UX **Apple** **iTunes** 

Value shifts from hardware to UX

Case example: Smartphone Revolution

Competition of phone specs (thickness/compact size/ battery life)

Shift in value

Competition shifts to different playing field

Disruptive innovation

Apple/Google (entry of non-telecom companies)

Open platform for apps offered new value which enabled users to select freely from a vast number of apps

Dr. Kenji Kushida
Research Associate,
Stanford University

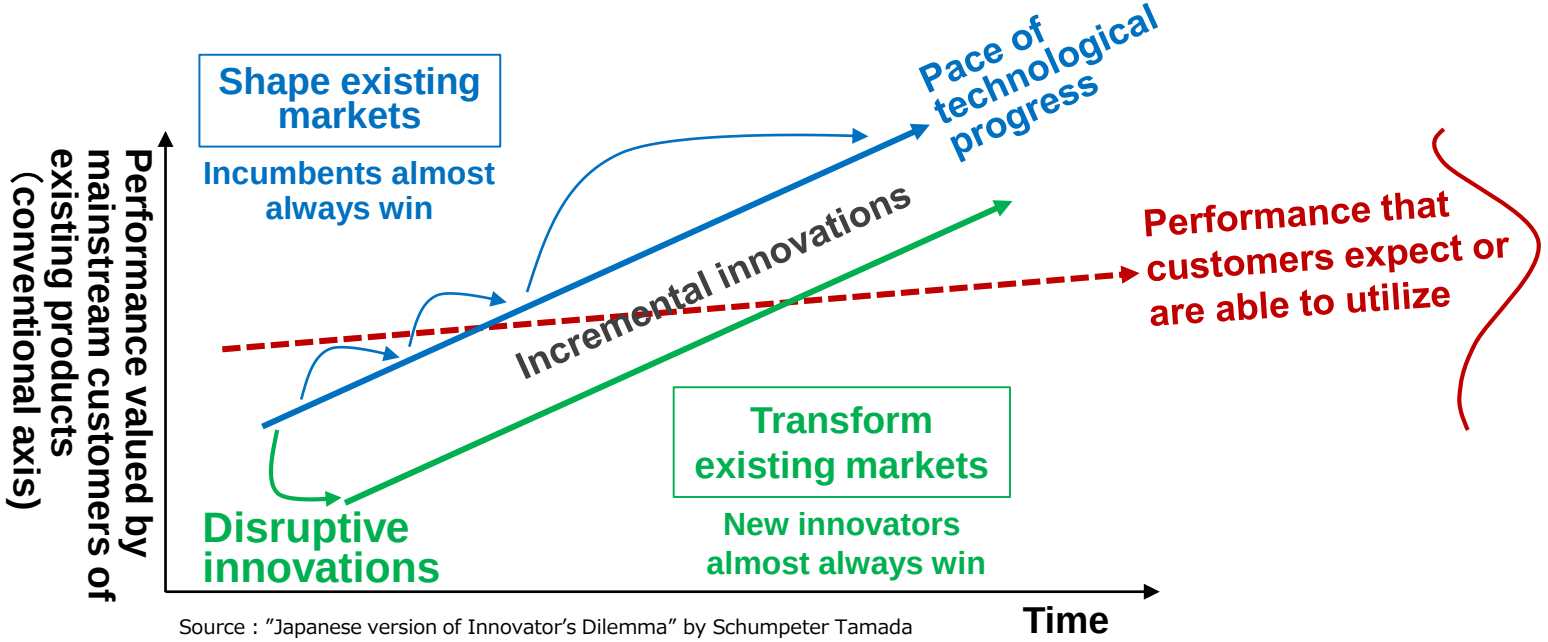
"Smartphones at first seemed like cell phones with big touch screens, but they actually offered an entirely different value."

Look out for changes in game rules and value evaluation axis.

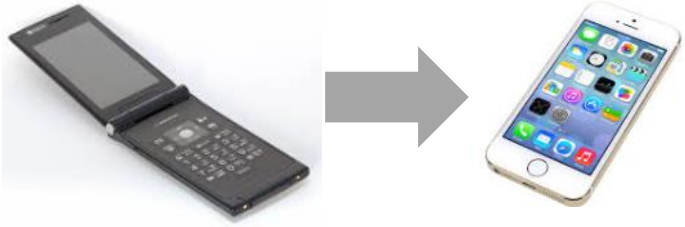
The mechanism of disruptive innovation

"Further upgrades in the quality valued by mainstream customers of existing products become meaningless. Focus shifts to a new value. Entrants nearly always win."

Prof. Schumpeter Tamada
Research fellow at the Research Institute of Economy, Trade, and Industry (RIETI)
Kwansei Gakuin University



Source : "Japanese version of Innovator's Dilemma" by Schumpeter Tamada



The first smartphones were less competitive on the conventional axis (shorter battery life/lower resolution images), but customers turned to the new values the smartphones offered.

Silicon Valley D-Lab’s concerns

1. Prelude to disruptive innovation (4 trends)

Prof. Schumpeter Tamada
Research fellow at the Research Institute of Economy, Trade, and Industry (RIETI)
Kwansei Gakuin University

"Disruptive innovation may first seem like a toy with many flaws. However, it imperceptibly creeps up to disrupt the existing industry."

Sharing

Another unlicensed cab?

UBER

Connected

Who wants to control your home from the car?

AMAZON

Electric Vehicle（EV）

Can't travel long distances?

TESLA

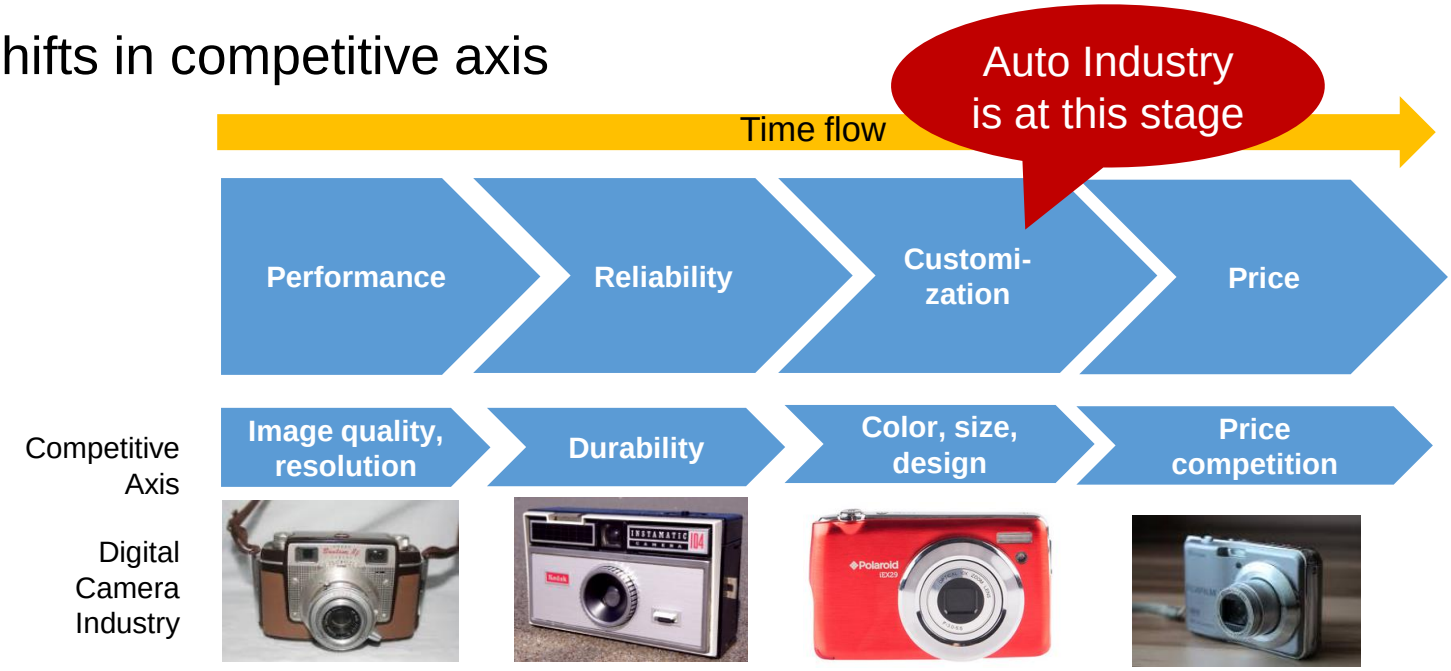
Autonomous Driving

Way too far in the future…

WAYMO

The value the consumers seeks in a product (hardware) changes as time goes on. It is likely to eventually come down to price competition.

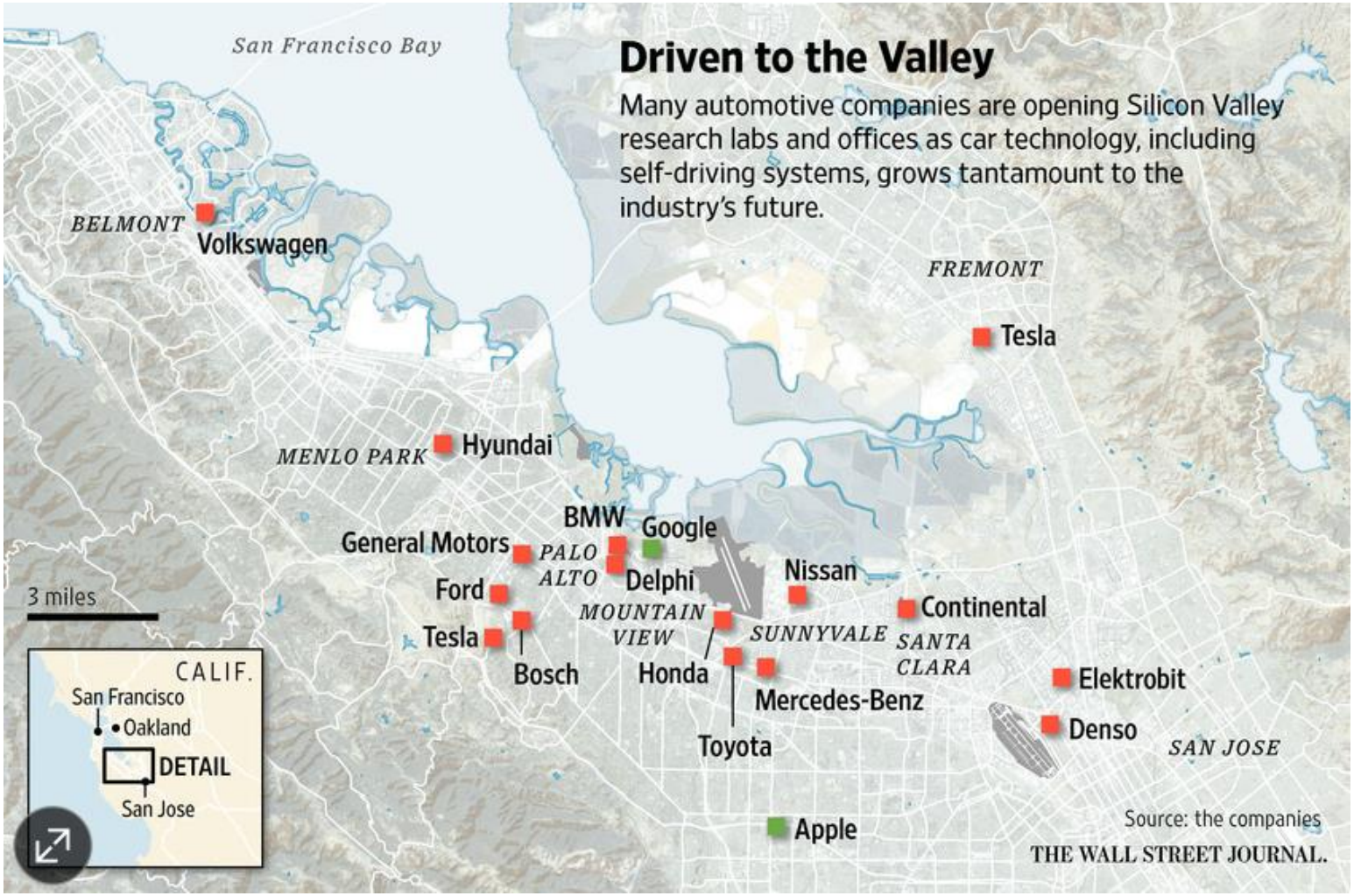
- Shifts in competitive axis



Prof. Schumpeter Tamada
Research fellow at the Research Institute of Economy, Trade, and Industry (RIETI)
Kwansei Gakuin University

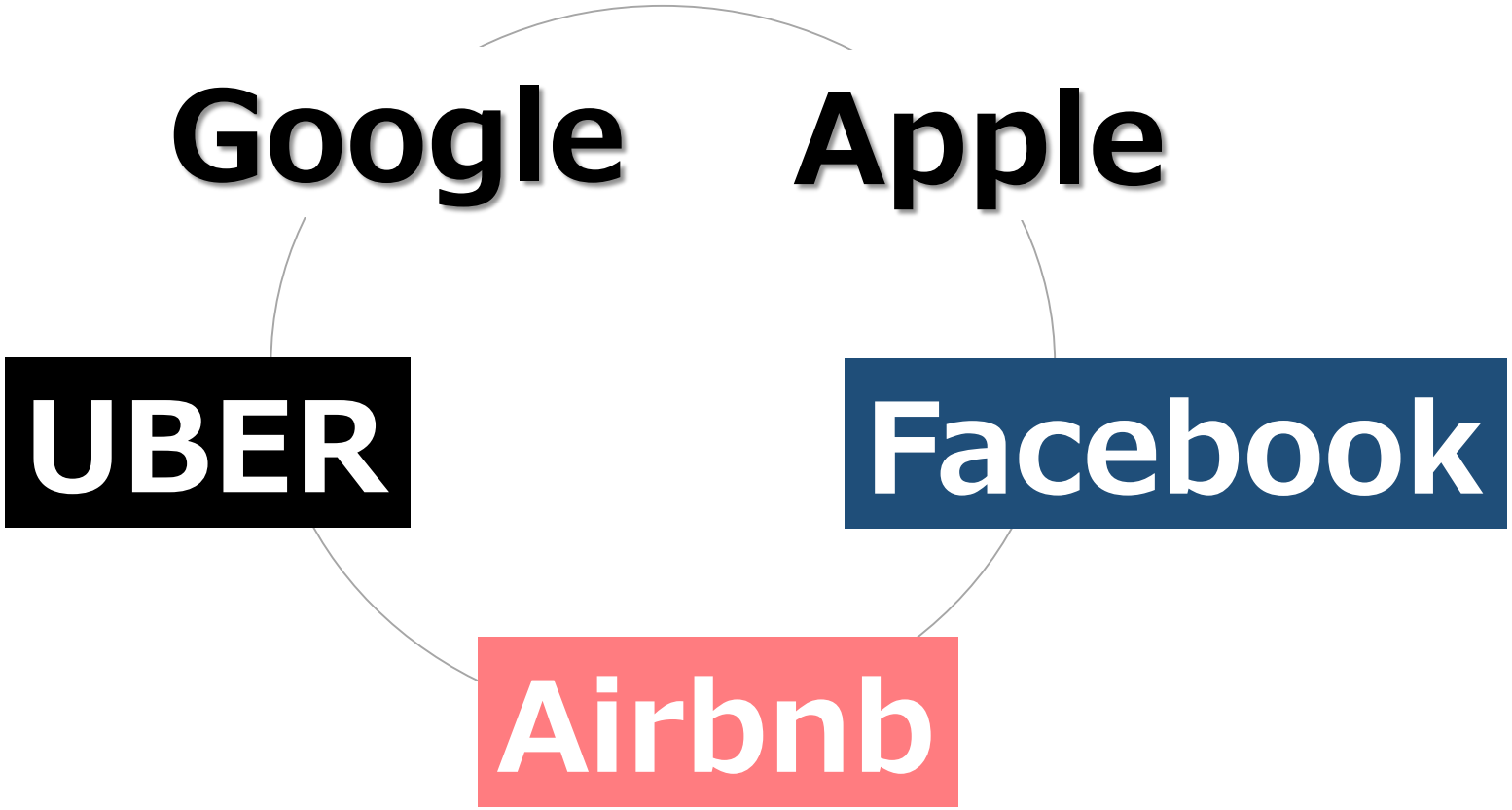
"Consumer satisfaction overshoots in the final stages of customization. Further quality improvement is no longer important to consumers, and consumers start focusing on price. KODAK collapsed in 2012 due to a price war and competition with digital cameras and smartphones. **Automobiles are also presently in the later stages of customization."**

Automakers and suppliers from all over the world are establishing their bases in Silicon Valley.



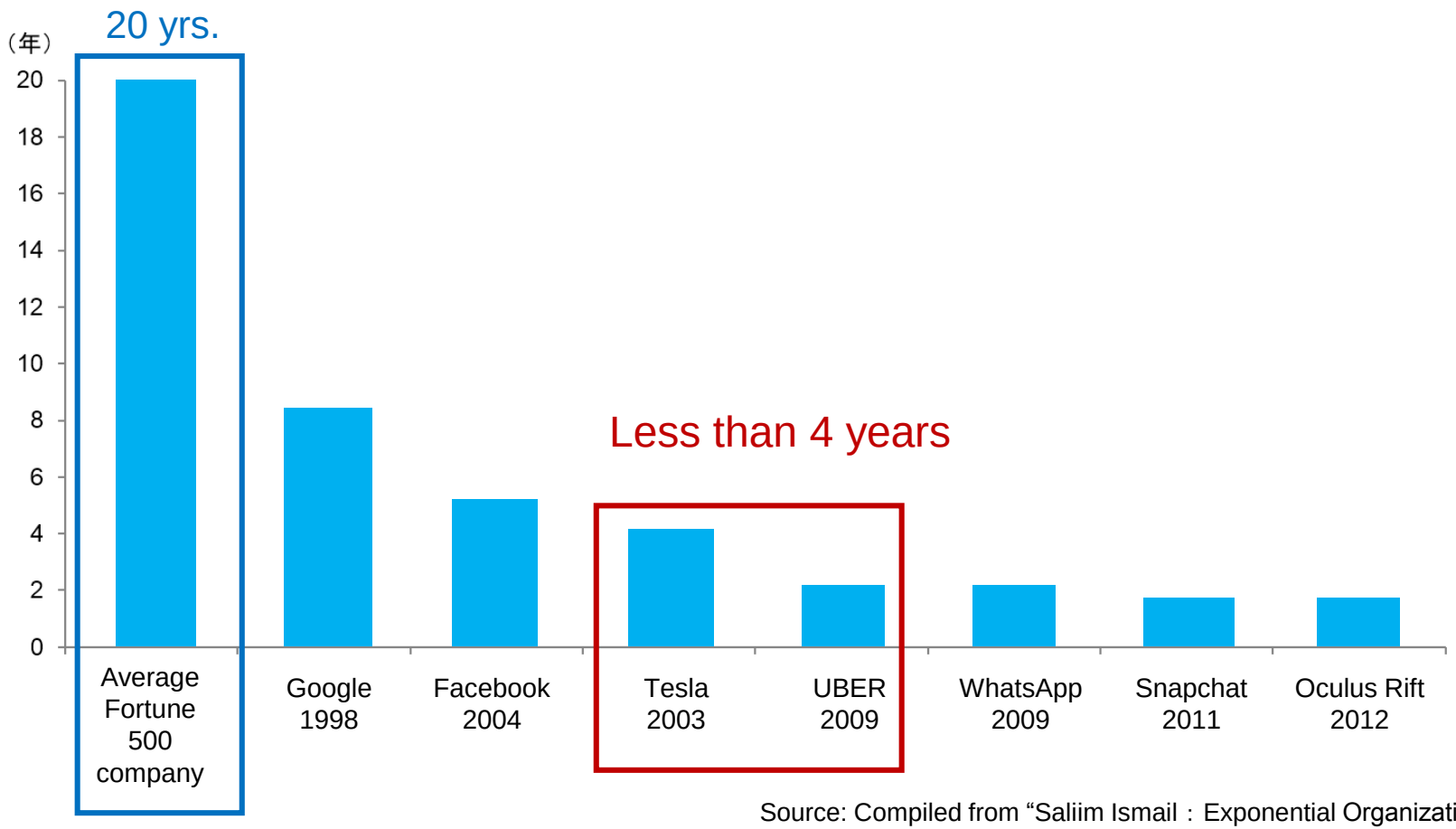
引用：THE WALL STREET JOURNAL

Silicon Valley has produced many of the world's leading companies.



In Silicon Valley, firms grow at a phenomenal speed. The auto industry is no exception.

Years it took to reach total market cap of U.S.$1 billion

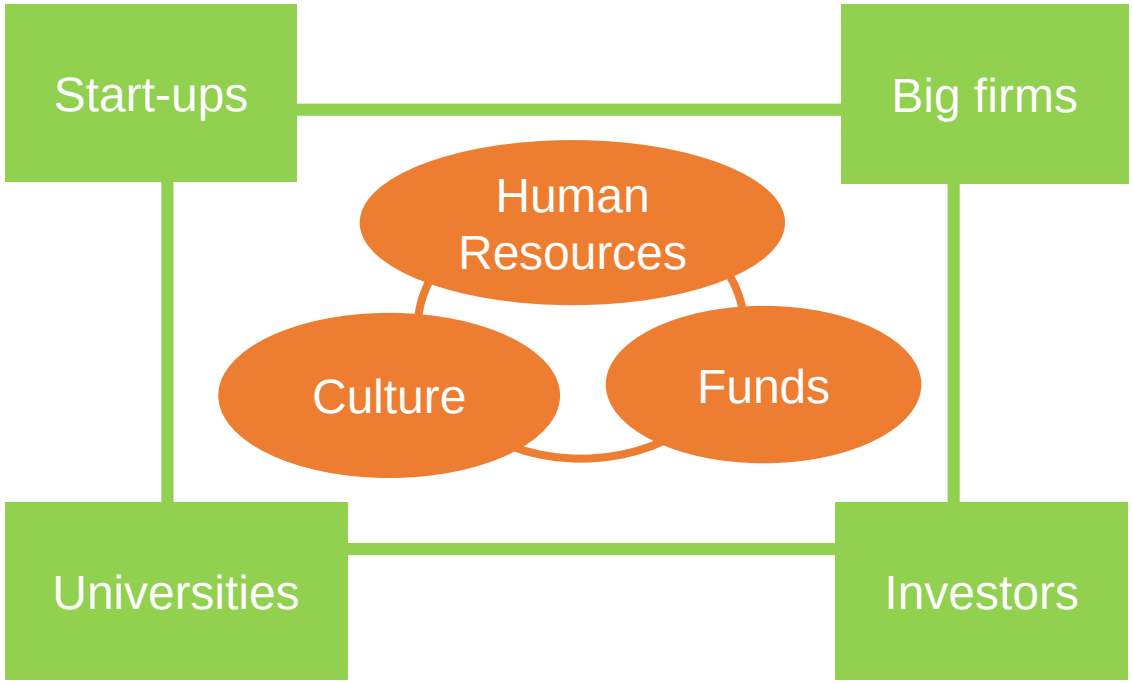


Source: Compiled from “Saliim Ismail：Exponential Organizations”

CEO, Auto Company

"Silicon Valley's distinctive feature is **its human resource, culture, and funds**. The first feature of Silicon Valley is the acceptance of failure. Silicon Valley has tremendous waste. We take the best people from all over the world and concentrate them here. The process of invention is very wasteful but very good to adopt the rapid change."

Silicon Valley's Innovation Ecosystem



Analyzed by D-Lab

1. Silicon Valley's talented human resources

The world's most talented individuals are flocking to Silicon Valley, where they now immerse themselves in this theme: Automobiles

CEO, Auto Company

"We take the best people from all over the world and concentrate them here."

Dr. Stephen Zoepf
Executive Director of CARS

"In Silicon Valley, highly specialized individuals people can work in many companies and places."

"A holy grail in Silicon Valley now is automated driving."

Dr. Kenji Kushida
Research Associate, Stanford University

Elon Musk

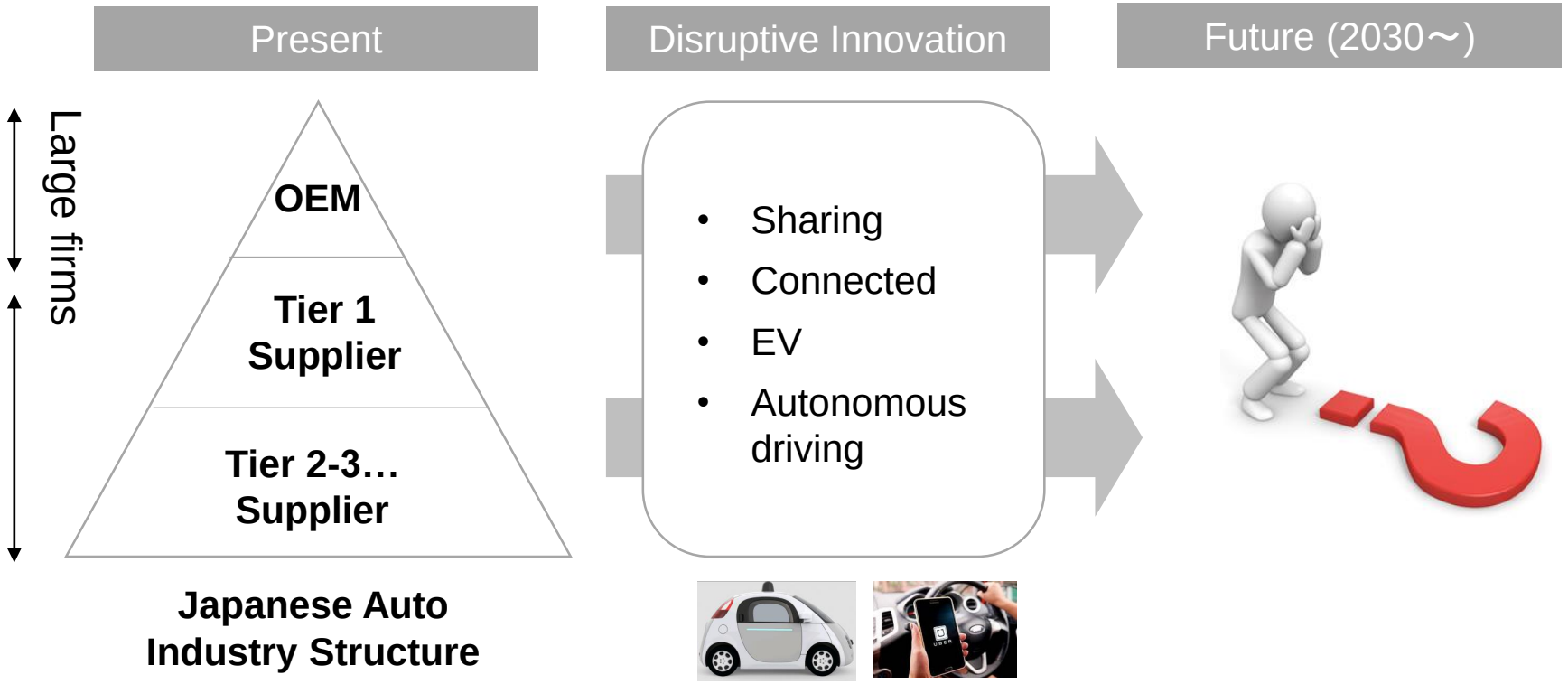
Paypal

SpaceX

TESLA

"In Silicon Valley, it is more valuable to watch the careers of star individuals rather than follow just companies. Elon Musk, for example, started by founding a map information company, selling it and founding PayPal, then selling that to get the funding to found SpaceX and Tesla. He was not an "automobile guy" but he is now disrupting the automobile industry (and space)."

In Silicon Valley ,we felt an imminent threat toward Japan's key industry -- the automotive industry



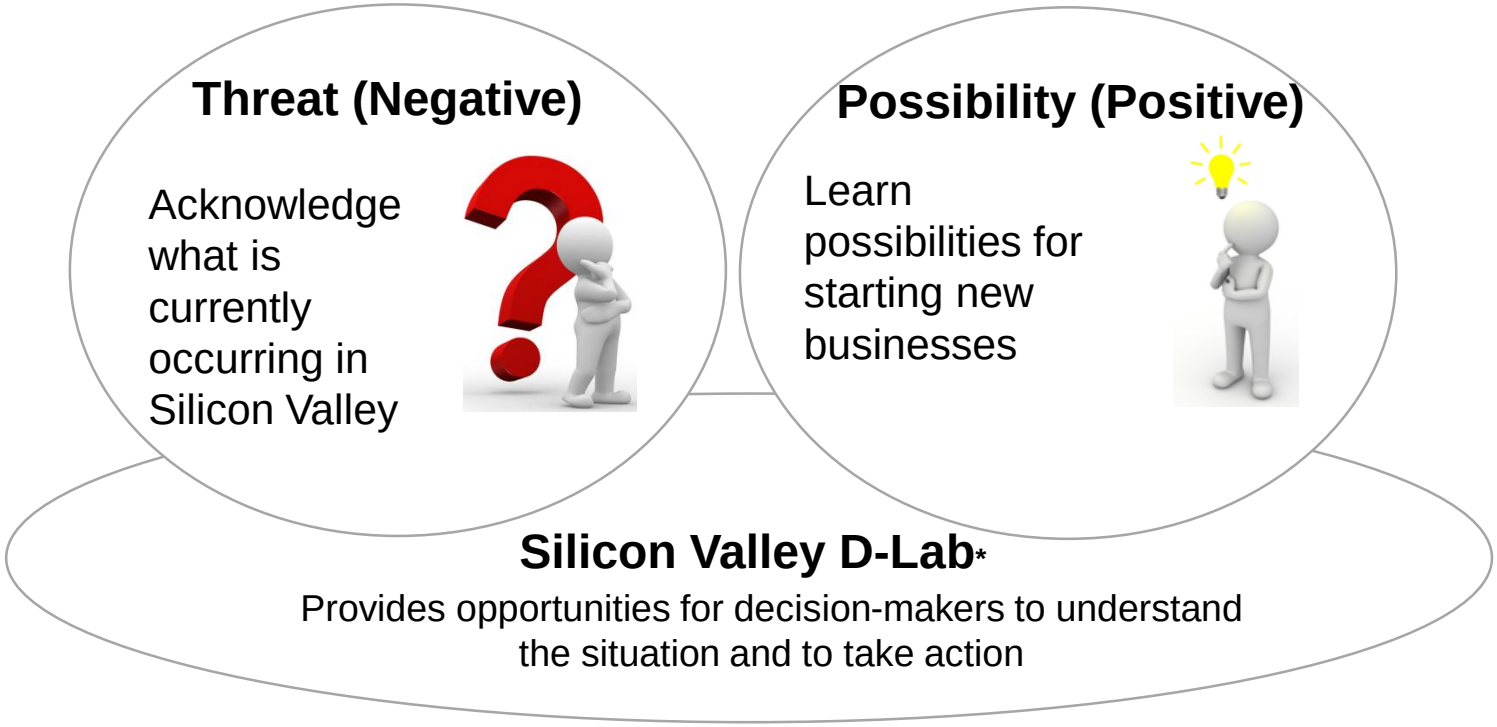
The Japanese auto industry is not aware of the wave of disruptive innovation very possibly heading its way. This disruptive effect may spread to its supporting industries.

1. What's important

To know.
To take action.

1. The goal of Silicon Valley D-Lab's

Our goal is to alert the Japanese auto industry of these changes, and to trigger future growth in the manufacturing industry.



Output:
Promotion of innovative actions unconstrained by the conventional business of each respective firm.

(Hopefully leading to an increased number of Japanese firms in Silicon Valley.)

*The name intends to be a **Lab** that **Drives** innovation

1. Silicon Valley D-Lab Project Members

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経済産業省
Ministry of Economy, Trade and Industry
METI

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（in no particular order）

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CEO of Toyota Research Institute

Dr. Stephen Zoepf
Executive Director of CARS

Dr. Kenji Kushida
Research Associate, Stanford University

Prof. Schumpeter Tamada
Research fellow at the Research Institute of Economy, Trade, and Industry (RIETI)
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Beans International Corp CEO

Mr. Yokichi Koga
Drivemode Co-founder & CEO

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NIKKEI
日経BP社
NHK

3-Step Implementation (US→Japan→US)

1st Step
Feb. 2017

Silicon Valley Workshop (US)

- Conduct workshops with thought leaders in Silicon Valley's auto industry

→ Compile report

経済産業省 Ministry of Economy, Trade and Industry (METI)

2nd Step
Mar. 29, 2017～

Event targeting Japan's Auto Industry (Japan)

- Hold a briefing session based on complied report
- Release report to the general public

経済産業省 Ministry of Economy, Trade and Industry (METI)

3rd Step
Summer 2017～

Silicon Valley tour by Japanese firms in the auto industry (US)

- Accept visits: Showcase the work of Japanese people in Silicon Valley
  (presently under consideration)

JETRO Japan External Trade Organization

“Let’s reinvent Japan’s *monozukuri*, manufacturing, in Silicon Valley”

2

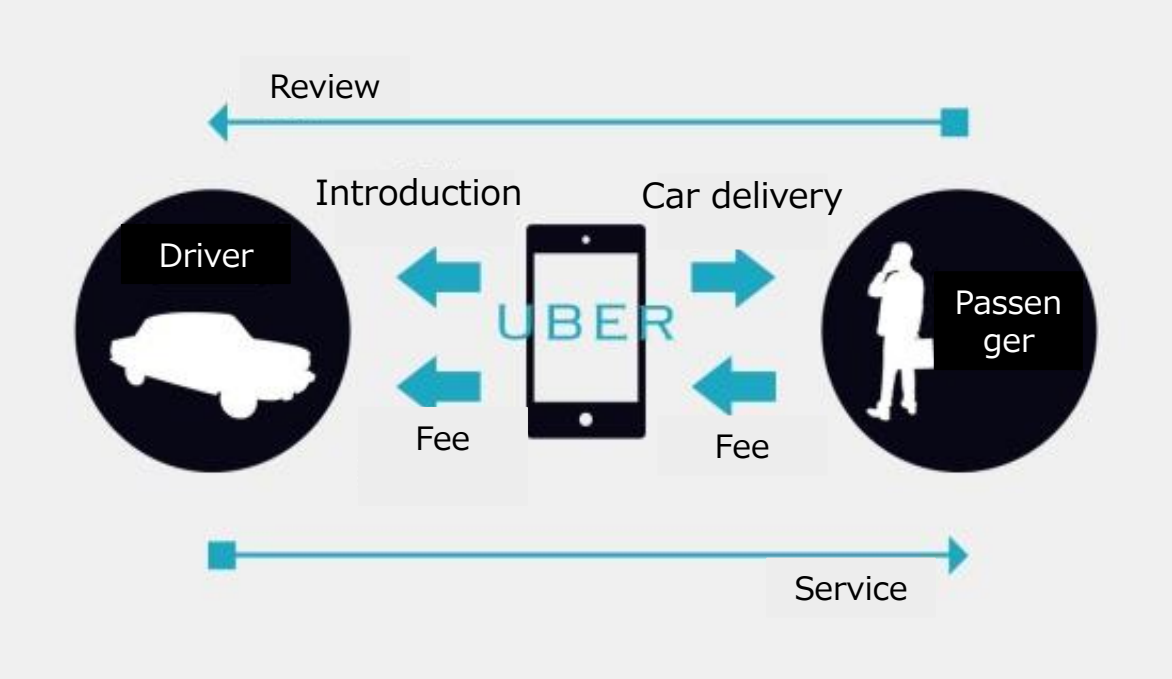
Understanding the current 4 big trends in the auto industry

2-1. Sharing
2-2. Connected
2-3. Electric Vehicles (EV）
2-4. Autonomous Driving

2-1. Sharing

UBER's service matches drivers and customers via smartphones (ride-sharing service)

- UBER is mentioned as one example of a ride-sharing company*



Source: Business +IT "Corporate value worth 5 trillion yen, what's brilliant about Uber's business model"
From hereafter, UBER is mentioned in this document as one example of a ride-sharing company.

Founded in 2009

Service provided in 500 cities

Corporate value: Approx. 7.6 trillion yen (Honda: 6.5 trillion yen)

Approx. 1 million users / day

Achieves usage of over 2 billion times (as of June 2016)

Has over 1.5 million drivers

Now an important transportation infrastructure

UBER offered value to society, drivers, and customers

Society

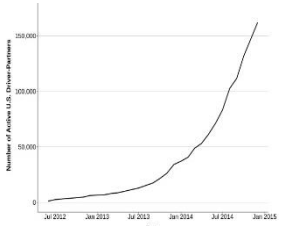
- Alleviates congestion
- Frees up parking spaces

Customers

- Able to easily get a ride anywhere
- Safe/quality service
- Lower fares compared to taxis
- No tipping

Driver

Easy way to earn money
No need to worry about fare-cheating



引用: amazonaws.com

Number of registered drivers

2-1. Trend brought on by UBER

UBER realized a society where people no longer need to own cars in urban areas.

- The future generation mobility trend originates in urban areas
- Percentage of population in urban areas:
  30% (1930) → 50% (2015) → 60% (2030)

Car ownership → **Mobility as a Service**

Dr. Kenji Kushida
Research Associate,
Stanford University

"A car spends 95% of the day in a parking space."

"Students claim it is much better to spend about a 10,000 dollars on UBER a year, as opposed to owning a car and having to pay insurance, parking, gas, and exerting the time and effort to drive themselves."

Prof. Schumpeter Tamada
Research fellow at the Research Institute of Economy, Trade, and Industry (RIETI)
Kwansei Gakuin University

"I spent 6 months in Silicon Valley to see if I could manage without owning a car. As long as there was UBER, everything worked out fine."

Existing automakers announce positive approaches toward car-share

Europe	**DAIMLER CEO Dieter Zetsche**	**"In the future, people will be able to ride cars anywhere in the world ."** ⇒ Provides car-share services around the world, using car2go	• Offers"car2go" in various countries. • With more than 1 million users, it has established its status as the world's #1 car-sharing company.
	BMW Former CEO Norber Reithofer	**"Conventional strategy will no longer promise future success."** ⇒ "Number ONE for 2020" to offer premium service on top of its luxury vehicles	• Offers car-share services "Drive Now" • Invests in P2P park sharing via VC
U.S.	**GM CEO Mary Barra**	**"We're going to disrupt ourselves."** ⇒ Declares head-on challenge against emerging powers like Uber and Google.	• Offers "Relay Ride" (P2P carshare) as one of its connected services. • Invests in rideshare company "Lyft"
	FORD CEO Mark Fields	**"We will exert a company-wide effort toward realizing smart mobility."** ⇒ Enters into car-sharing, To transform its company from an automaker to "mobility company."	• Offers carshare service "Ford2Go" • Invests in a major carshare/rental company "ZipCar"

Shows positive attitude toward converting its business to tackle social issues

Source: Deloitte Tohmatsu Consulting

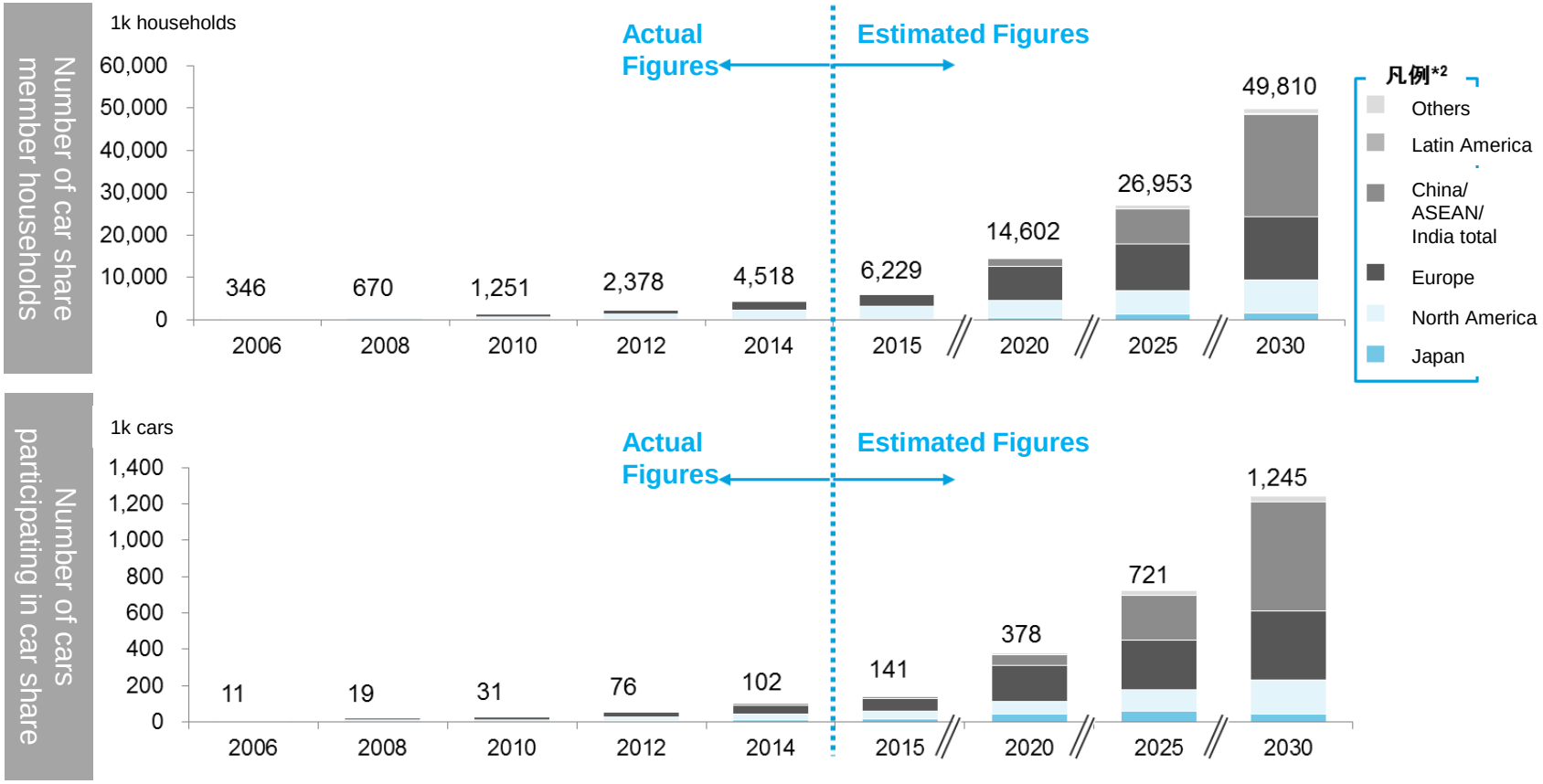
Mr. Tak Miyata
Scrum Ventures
Founder & General Partner

"At an event targeting executive members from auto-related firms, approximately only 10 out of about 300 members had used UBER."

2-1. Car sharing market is rapidly expanding

The car sharing market is expected to undergo rapid expansion in all parts of the world. However, the expansion shall be limited in Japan.

Market size estimate for car sharing



Source: Deloitte Tohmatsu Consulting

*1： Put together by Deloitte based on “Strategic Insight of the Global Carsharing Market.” (Frost and Sullivan) up to 2014. Numbers for 2015 and after calculated by Deloitte. Based on assumption: “Number of members = number of member households”

*2：The carsharing market is practically non-existent in Middle East and Africa at present. Since the market size is estimated to be very limited in year 2030 as well, it is excluded from the graph.

2-1. Economical efficiency of car sharing

With the exception of Japan, car sharing is a rational choice in urban cities around the world.

Mr. Yokichi Koga
Drivemode Co-founder & CEO

"A country's population density, size (area), and GDP determines whether carsharing is economically efficient."

In Japan, even if regulations are eased, it is possible that car sharing may not prevail in Japan.
Reasons:

- Easy to hail a taxi.
- Taxi service level is high.
- Public transportation is sufficiently developed.
- The culture is not very open to side-businesses.
- Not many potential drivers.

Mr. Hiro Saijo
Yamaha Motor Ventures & Laboratory Silicon Valley Inc. CEO

Mr. Tak Miyata
Scrum Ventures Founder & General Partner

"Car sharing may not penetrate the Japanese market, but it is important to understand that it is definitely becoming a trend in urban cities around the world."

2-1. Economical efficiency of car sharing

It is more economical to give up car ownership if annual mileage is 12,000km (7,456 miles) or less.

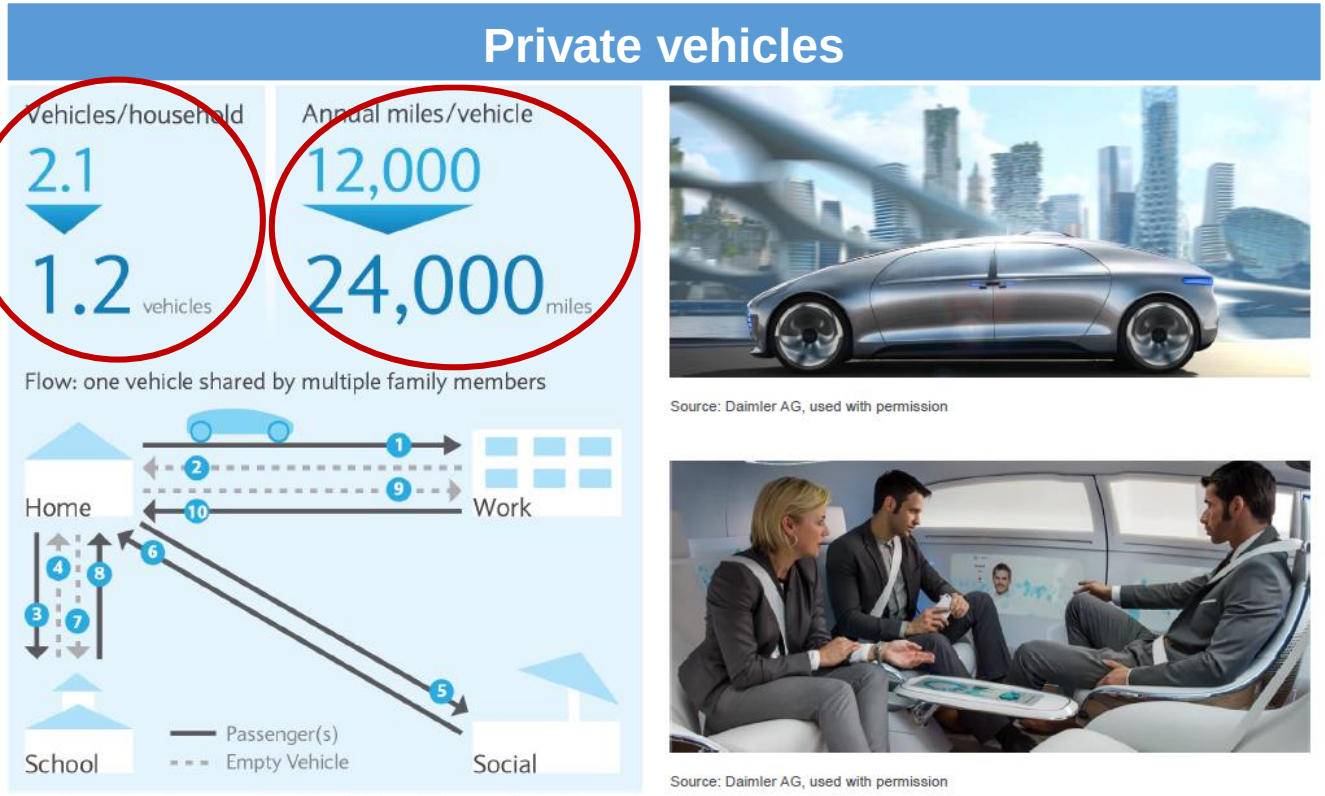
Annual mileage of 1,000km (621 miles) or less	Annual mileage of 12,000km (7,456 miles) or less	Annual mileage of 12,000km (7,456 miles) or more
		
Rideshare	**Car share**	**Car ownership**

Source: Nikkei Business Publications “Mobility Innovation 2030 Auto-Industry’s Disruption and Innovation”

The number of private vehicles may halve from 2 to 1, while travel distance may double.

→ ▼ Less models/designs ▼Declining value of ride experience

→ △ Increased maintenance cost per car

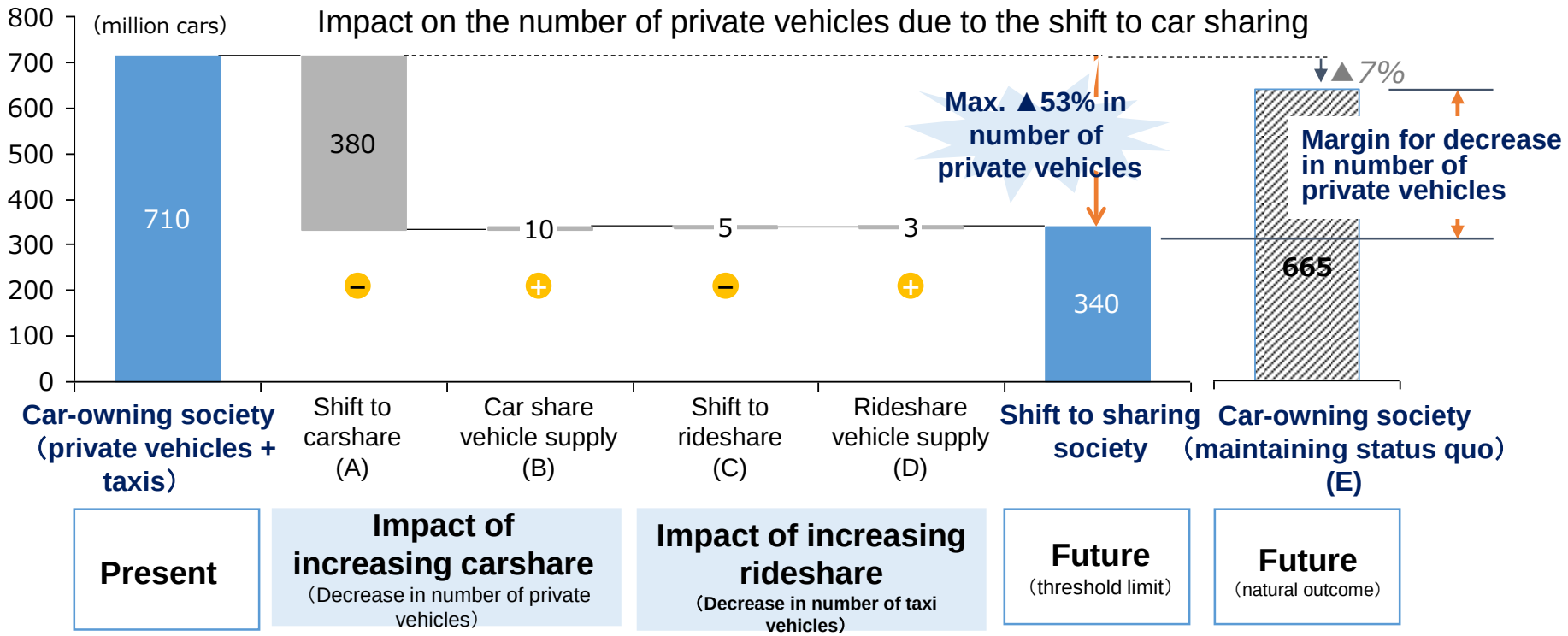


The number of private vehicles may decrease by up to 53% due to the shift by car share & rideshare

- **Impact on the number of private cars in the 8 regions under study**

Preliminary calculations based on the following assumptions

(A) Decline in the number of private vehicles, assuming that 100% of users to which car share costs are the least expensive based on annual mileage shifted to carshare
(B) Vehicle supply is calculated assuming that a single car share vehicle can be shared across 40 members.
(C) Number of taxis owned in the 8 regions under study (assuming that rideshare is the alternative to taxi).
(D) Average number of people riding a taxi is assumed as 1.5 people, and rideshare 2 people.
(E) Number of private vehicles if carsharing spreads worldwide at the level equal to Switzerland (approx. 1.3% per total population; highest penetration among all countries)



Source: Nikkei Business Publications “Mobility Innovation 2030 Auto-Industry’s Disruption and Innovation”

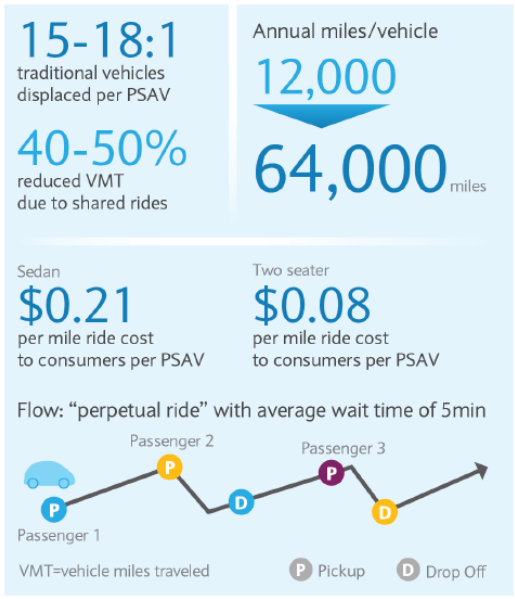
2-1. Sharing service seeking commodity vehicles

A single sharing service vehicle may displace 15 or more vehicles.

→ ▼Brand name is irrelevant

→ ▼Traditional vehicle spec to change

Sharing service vehicle



Source: Fagnant, Kockelman, Bansal, "Operations of a Shared Autonomous Vehicle," Jan. 2015; UMTRI; Barclays Research estimates

Desired spec =commodity vehicle

- Low price, low maintenance cost
- Operation ratio increases from 5 to 50%, short lifespan of approx. 2 years in exchange for highly reliable performance.
- No high-quality entertainment for driver.

User responses

Can't recall the brand name of UBER vehicle just used that day.

- Any manufacturer is acceptable as long as the car is new.
- Safety and convenience, being able to find it when you need it is most important.

BARCLAYS

20 July 2015

- "One UBER car might be shared across 30 or 40 people."
- "Cars on the road would be reduced by about 90%."

Travis Kalanick
CEO, UBER

Source: Forbes, In Rare Interview, Google and Uber Chiefs Talk About The Future And Bizarre Stories (In 5 quotes), 2015.11.18

Dr. Stephen Zoepf
Executive Director of CARS

"Do you remember maker of the UBER car that you rode today?
What's most important in a sharing service is not the hardware, but the service itself, including promptness."

Cars with unpuncturable tires, freedom to abandon at any location of rider's choice, and car doors to be unlocked using smartphones!?

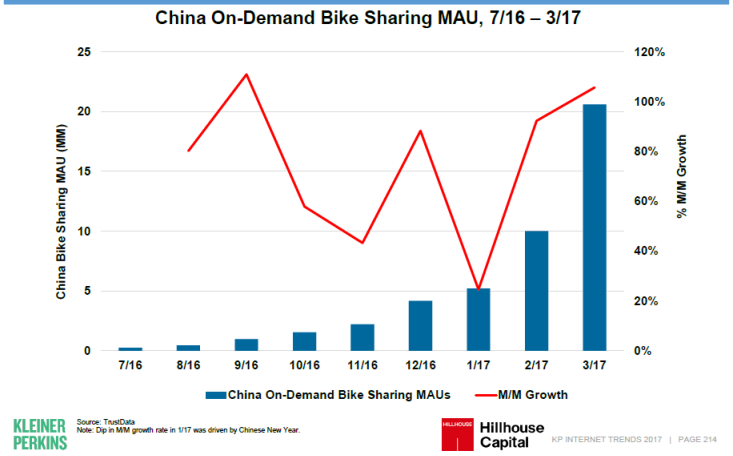
Rapidly spreading bike-sharing service in China

- Affordable price（approx. 15 yen per 30 min.）and convenience of being able to abandon at any location led to its rapidly growing popularity.
- 20 million users per month, with increase rate of over 100% per month.

Different spec from commercially available bicycles.

Sturdy, with unpuncturable tires, built-in GPS, and can be unlocked using smartphones

Bike-sharing bicycles in China



Source: Mary Meeker「INTERNET TREND」

"4 yrs. maintenance free" by Mobike
- Unpuncturable tires (airless tires)
- Full-aluminum body

Image source: Hongkong/Shenzhen China Sightseeing Life Information Bureau

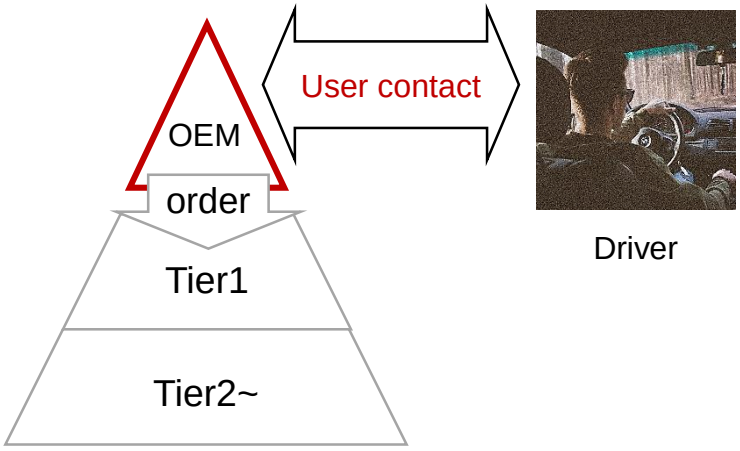
- Built-in GPS allowing to be left off at any location
- Can be unlocked using smartphones

Image source：Mobike

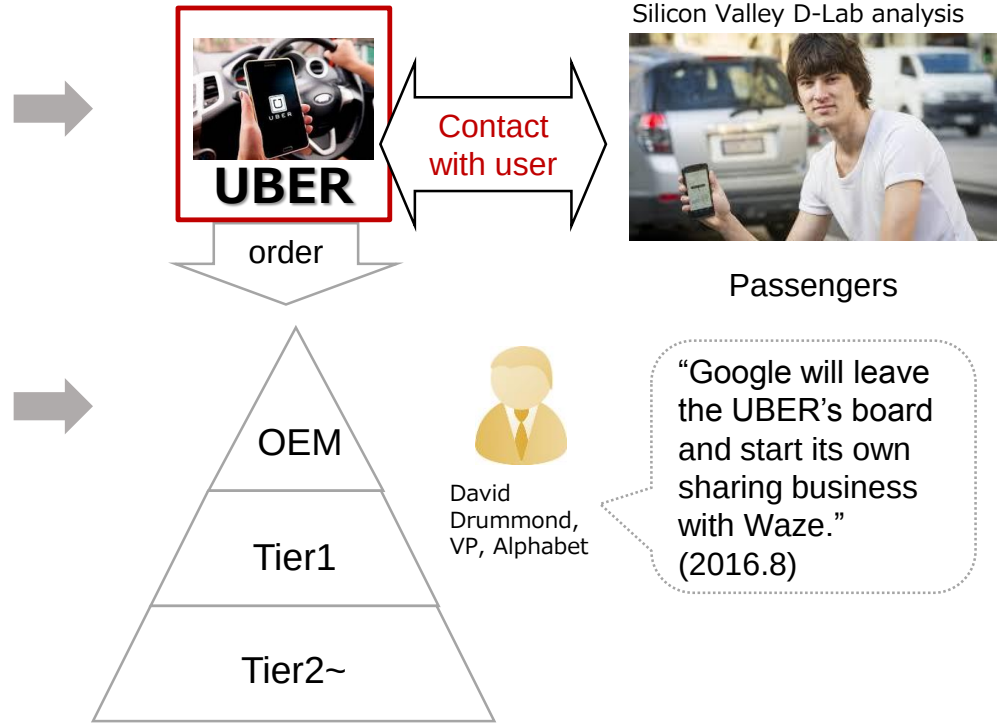
Sharing service vehicles will require a different spec from private vehicles as well.（Different gears, different tires ＝new business opportunity）

2-1. Sharing companies like UBER may be a contoller

- **Pyramid structure with automakers (OEM) on top**
  OEM unable to follow how the car is used after the sale



- **UBER (and similar sharing companies) determines the spec**
- **Uber (and similar sharing companies) now leads the OEM's pyramid structure**
  Uber holds all information on vehicles and human movement



Source: The New York Times, Uber and Alphabet's Rivalry Heats Up as Director Chooses Sides, 2016.8.29

Dr. Stephen Zoepf
Executive Director of CARS

"If UBER rises to the top of the pyramid, they would most likely request the least expensive car. Profit of the OEM will be squeezed."

2-1. Opportunities in the sharing era

Dr. Stephen Zoepf
Executive Director
of CARS

"The mobility service will become the core business, so lease models and business models that focus on profit from maintenance and repair parts would be effective. The market is considered 5-10 times the size of the conventional auto-manufacturing market."

"We need to understand the industry trend and identify the needs of end-users."

Mr. Hiro Saijo
Yamaha Motor
Ventures & Laboratory
Silicon Valley Inc. CEO

Mr. Yokichi Koga
Drivemode Co-
founder & CEO

"An average driver in a sharing business would drive 40-60 hrs/wk, a total of 80,000km/yr (49,709 miles/yr). Approx. 240,000km is considered as a guideline for replacing a vehicle, the car would be replaced in just 2-3 years. Automakers should design their cars according to this usage."

"Commodity cars need parts that are durable, reliable, and affordable. ⇒ Japanese parts manufacturers excel in this area."

2-1. Opportunities in the sharing era

Mr. Tak Miyata
Scrum Ventures
Founder and General Partner

"Didi (China) intends to become a mobility-service provider, moving into aircrafts and ships. It is important to explore beyond the existing business domain."

"Find new opportunities through open intercorporate alliances."

CEO, Auto Company

collaboration

TOYOTA ⇔ UBER

・Toyota and UBER jointly set up a service where Toyota leases its cars to UBER in the U.S., and the lease is paid directly from revenues from fares.

alliance

GM ⇔ Lyft

・GM provides driverless cars to Lyft for testing

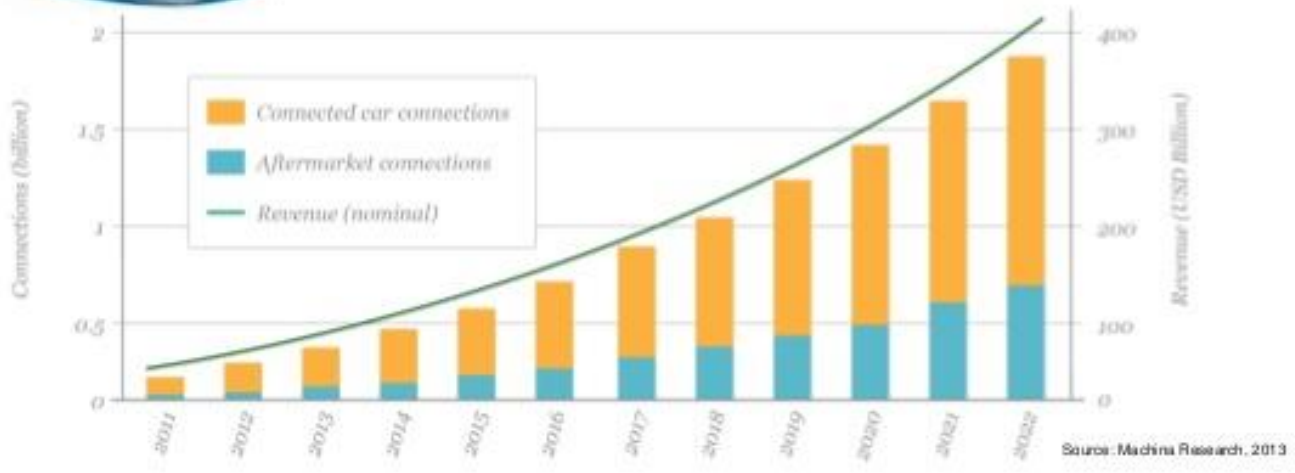
2-2. Connected

2-2. Rapidly expanding Connected Cars market

90% of all cars will be connected by 2020. Revenues will explode to $422B in 2022.

CAPTIVATING CONNECTED EXPERIENCES

Tremendous Market Potential



- Industry forecasts show 700M Connected Cars and 1.1B aftermarket devices by 2022
- Machina Research predicts that 90% of all cars will be connected by 2020
- Revenues will explode to $422B in 2022 from just $22B in 2012

st symphony teleca

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Cars may become more like smartphones

It will not have only maps and internet audio,
but have shopping or parking functions.

Elon Musk
CEO, Tesla

The Model S is not a “car” but a “sophisticated computer on tires.”

引用：Los Angeles Times :Elon Musk: Model S not a car but a 'sophisticated computer on wheels'

2-2. The real meaning behind becoming connected

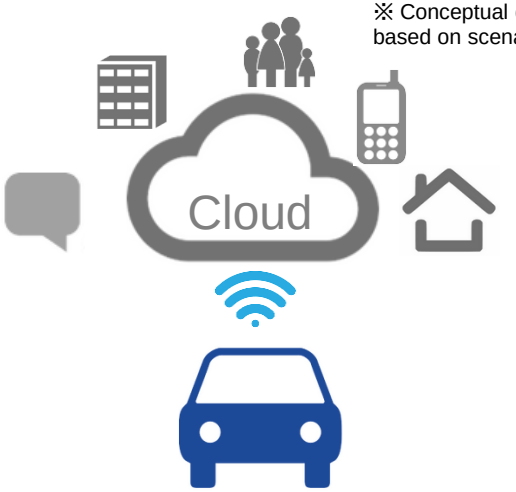
A seamless experience will become a value. The focus may shift from the cars themselves to becoming an equivalent to other internet devices.

What will cars be connected to?

Silicon Valley D-Lab analysis

Focus under existing industry

※ Conceptual diagram based on scenario on right

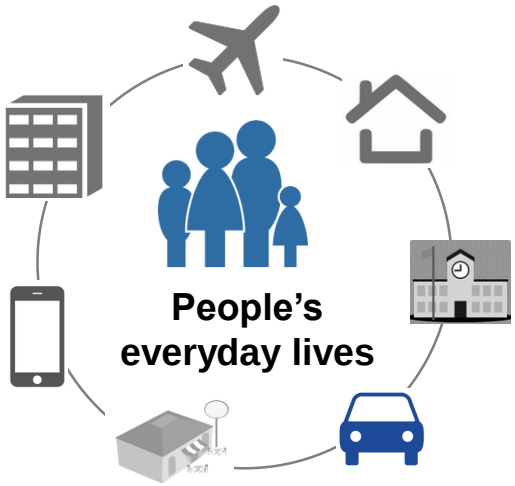


Focus on cars

- Controlling from cars
- Information coming from cars

Service PF＝automakers

Focus under IT industry
(possible scenario)



Focus on people's lives

Cars become a part of the chain formed by other service providing devices

- Can continue watching the same TV program inside the home and inside the car.
- Can continue playing the same game inside the car.

Service PF＝IT industry firms
(Google, Apple, Amazon, etc.)

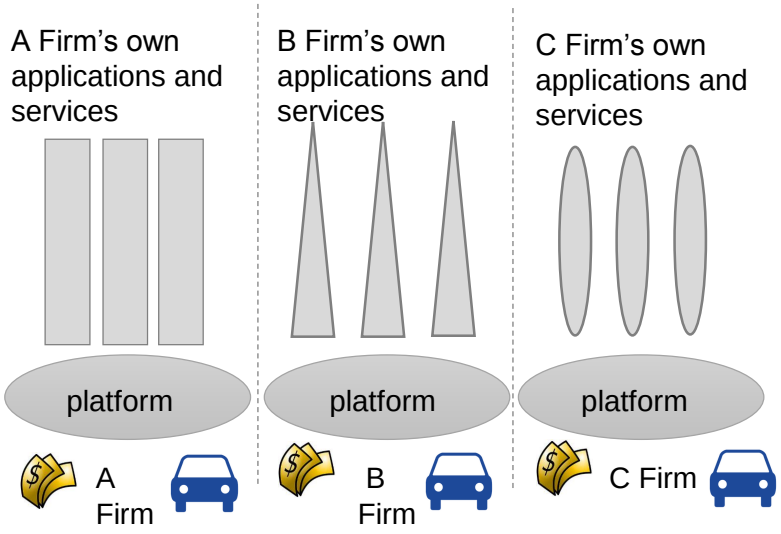
2-2. Impact on business structure

Services will be offered by developers from all over the world, and interface specification will be determined by IT giants such as Google and Apple. They will be making the profits.

Silicon Valley D-Lab analysis

Focus under existing industry

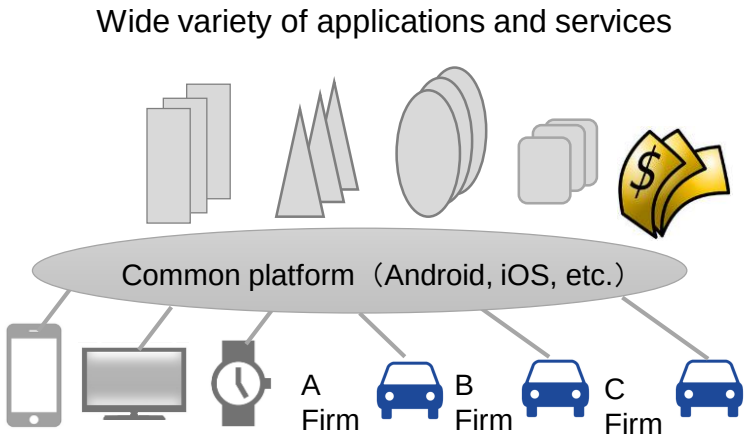
Automakers offer their own unique services



- There is differentiation among firms.
- However, fewer developers and services compared to IT (cell phone) industry
- Automakers make profit as well

Focus under IT industry
(possible scenario)

There will be a common platform for all the devices, and users may use their favorite services anytime they wish.

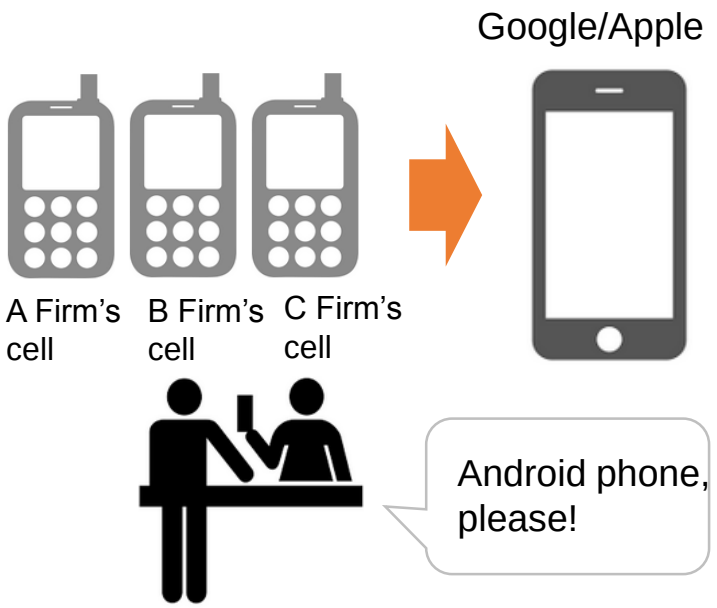


- All firms provide the same services, no room for differentiation
- Massive number of developers and services.
- Service providers and platformers will make profit mainly.

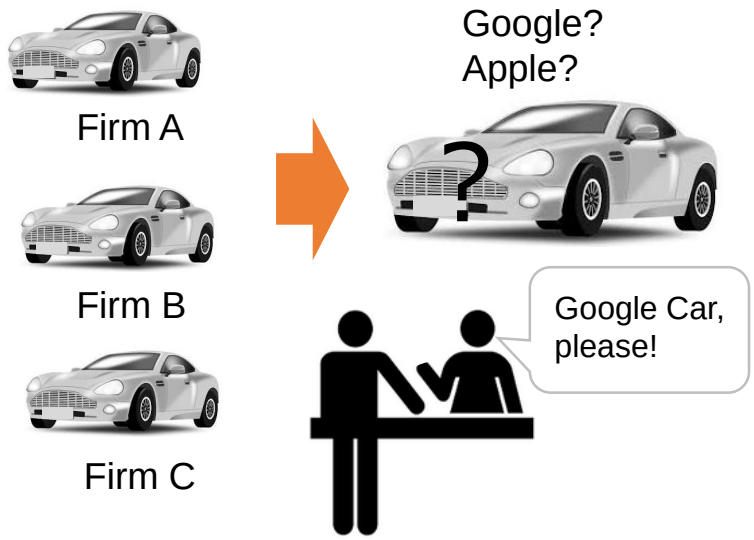
The same change could occur for cars.

Silicon Valley D-Lab analysis

Cell phones to smartphones



From existing cars to connected cars
(possible scenario)



CEO, Auto Company

"This is the phone that I bought from google, it does not say the name of the hardware manufacture, it only says the name of the company who design the cell phone and specific software inside. The danger of car industry is the same."

2-2. Impact on business structure

Theory based on smartphone history: It is possible that the value may shift from hardware to software/services.

Silicon Valley D-Lab analysis

Cell phones to smartphones

- Service providers gain profit
- Hardware becomes a commodity
  （Shift to SOC, standardized parts)
- Design specs determined by platformers
- Competitive differentiation limited to specific parts such as camera sensors and high brightness high definition displays.

From existing cars to connected cars
(possible scenario)

- Service providers gain profit
- Hardware becomes a commodity
  （Shift to SOC, standardized parts）
- Design specs determined by platformers
- Competition differentiation limited to specific parts such as sensors, LiDARs, and batteries.

2-2. Impact on business structure

Multiple simultaneous changes in technology, service, and infrastructure caused the smartphone revolution at a speed unimagined by the conventional industry.

Silicon Valley D-Lab analysis

Cell phones to smartphones

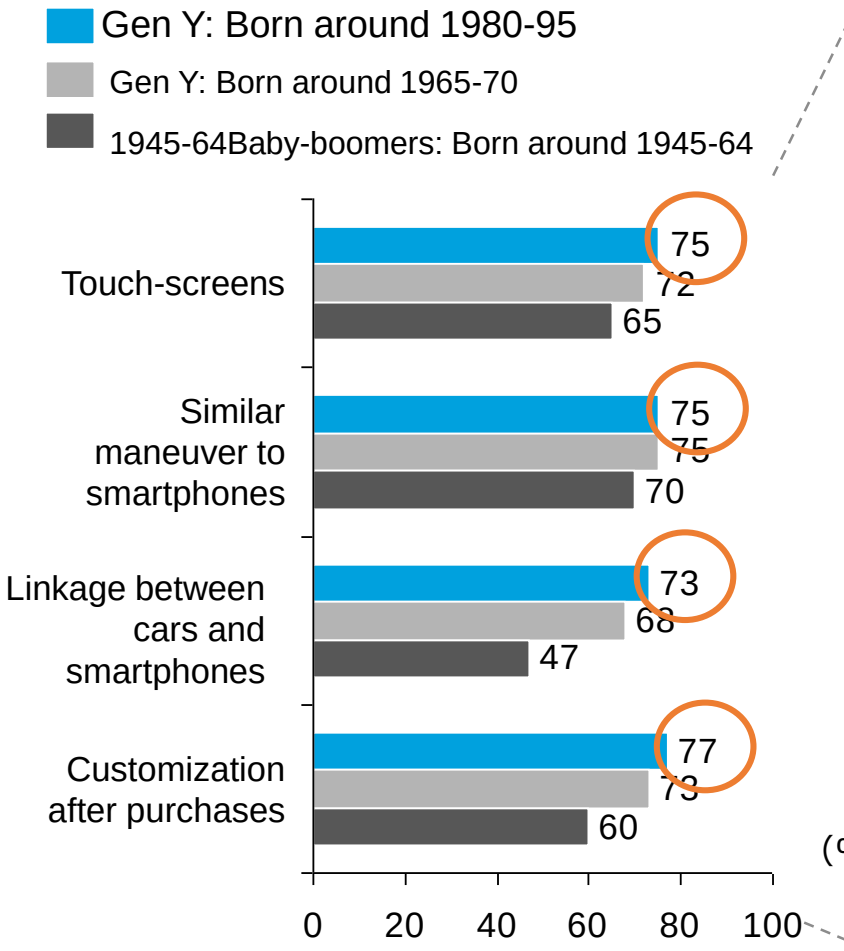
	Cell Phones	Smartphones	Result
Platform	Cell phone carrier PF (i-mode, etc.)	IT giant PF (Android, iOS)	Switch PF
Communications infrastructure	・2G,2.5G ・Profit from communication fees	・3G, 4G ・Unlimited connectivity = profit from service (Google, SoftBank, Apple)	Lower prices ↘ $
System device	Individual CPUs, antennas, wireless chips, etc.	Shift to SOC and standardized parts (Qualcomm, Foxconn)	Lower prices ↘ $
Key device= point of differentiation	LCD, camera sensors, batteries, etc.	LCD, camera sensors, batteries, etc.	High-value added products ↗ $
User value	Cell phone reception, long battery life, compact size, thin, durable, etc.	Use of popular apps, add-on functions, software updates, etc.	Different evaluation index

From existing cars to connected cars (possible scenario)

Conventional Cars	Connected Cars	Expected Result
Differentiated services from automakers	IT giant PF？	Switch PF？
Dedicated telematics device (or via smartphone)	・4G, 5G connectivity ・constant unlimited connectivity	Lower prices ↘ $
Various ECUs, sensor devices, etc.	Shift to SOC and standardized parts	Lower prices ↘ $
Engines, camera sensors, LiDARs, batteries, etc.	Camera sensors, LiDARs, batteries, etc.	High-value added products ↗ $
Mileage, reliability, comfortable drive, exterior design, crashproof	Crashproof, reliability, seamless experience, add-on functions, software updates, etc.	Different evaluation index

Younger generations seek connectivity.

- **Car functions desired by Gen Y**



Connectivity sought in cars

IVI*1

- Information from outside the car, such as information regarding infrastructure, roads, other cars, etc.
- Linkage with smartphones and other devices
- Viewing of contents via internet connection

HMI*2

- Advanced displays that convey accurate information
- System function that guides driving
- 2-way communication through voice/movement

Source：Developed based on Deloitte survey

*1 In Vehicle Infotainment ／*2 Human-Machine Interfaces

Movements in Silicon Valley

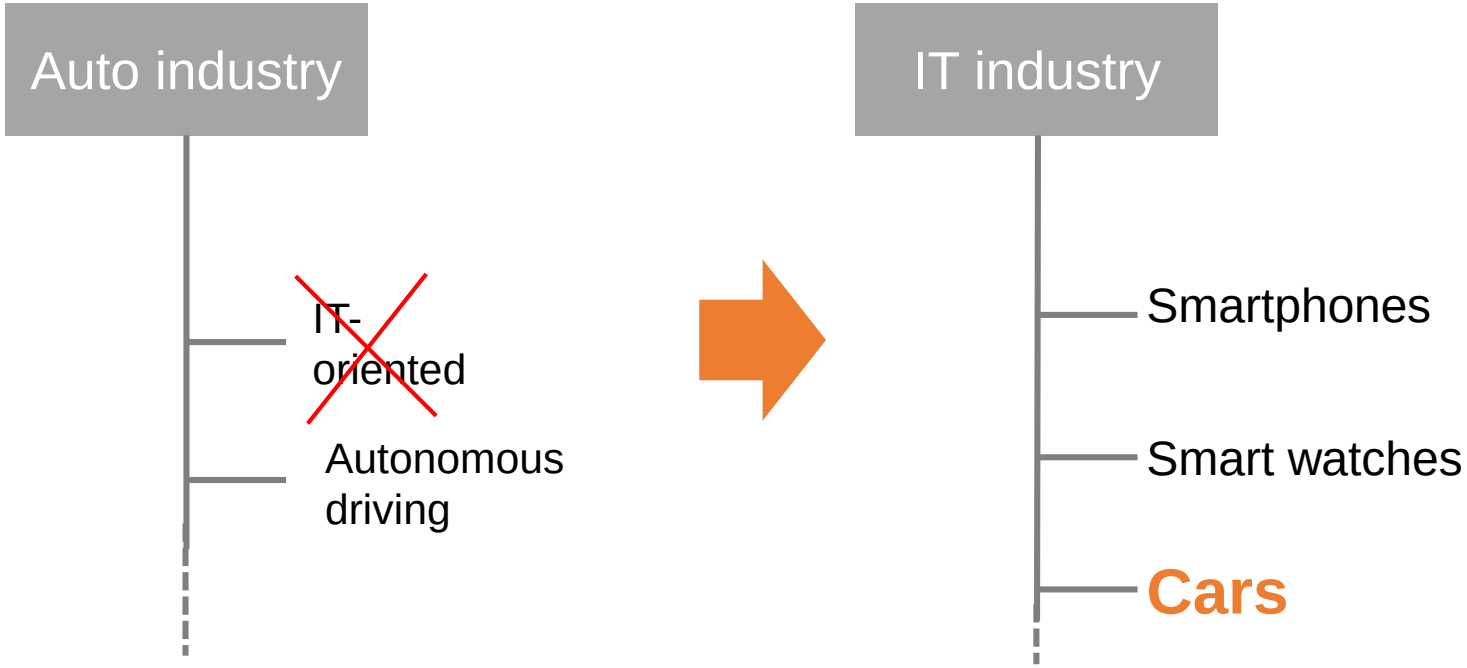
Ford	Declares shift toward service-providing firm. Aiming to hire 300 employees in Silicon Valley.
GM	Alliance with Lyft. Developing autonomous driving cars for carshare.
Nissan	Establishes base in Silicon Valley. Hires individual from NASA to head the development of Nissan's autonomous driving.
Honda	Establishes HSVL in Silicon Valley. Holds open innovation with local venture firms. Launches Android Auto and Car Play with Google and Apple. Announces possibility of partnering with Google's autonomous driving unit（Waymo）.
TESLA	Precursor to "Over the Air." Loads sensors and computer capabilities onto cars on the basis that the software would later be updated. Hiring top talents from Silicon Valley.

*As of Mar. 2017

Securing talents from Silicon Valley to promote shift to Connected Cars

2-2. Cars as products under IT industry

Cars are not becoming IT-oriented, but rather turning into IT products themselves.



"Cars will become a product under the IT industry.
"Cars" joined the list of IT industry products. IT was never a category under the cell phone industry, but in fact, "phones" were added as a new category under the IT industry."

Mr. Yokichi Koga
Drivemode Co-founder & CEO

2-2. Cars as products under IT industry

Mr. Yokichi Koga
Drivemode Co-founder & CEO

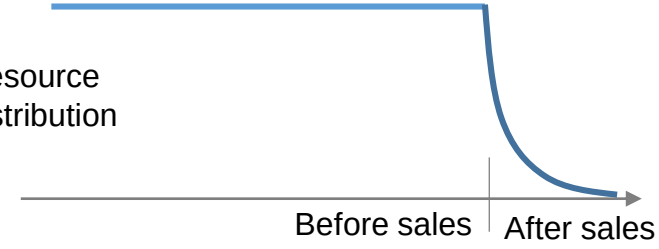
"Up until now, the goal of the manufacturing industry was to make the product and sell it. A "service" will face its real test after it is introduced to the world. An IT service firm focuses its efforts in making improvement after improvement after the service is out."

"Tesla is a Silicon Valley software company. This is the same way as updating your phone or your laptop."

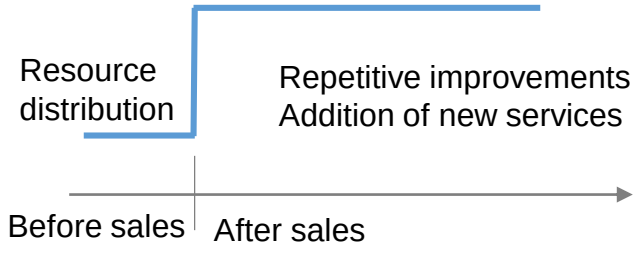
Elon Musk,
CEO, Tesla

* Conceptual diagram based on possible scenario

Conventional manufacturing



IT service industry



There can be no improvements without understanding how the products are used by the users = in other words, the user contact point is extremely important

Source : Los Angeles Times :Elon Musk: Model S not a car but a 'sophisticated computer on wheels'

The manufacturing industry needs to shift the focus to user experience

Approach
- Learn from IT firms（Ex: after-sales servicing, maintenance business）
- Partner with or acquire IT firms

CEO, Auto Company

“Cars will also become connected, and the roles of software will grow exponentially. You can make the last minutes changes just before shipping and also after shipping. It’s the constant improvement.”

Dr. Stephen Zoepf
Executive Director, CARS

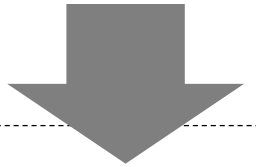
“IOT parts：We will need to continue collecting data after the sale, to research and improve how they are used.”
（Example of GE’s engine）

Increase of connected services may shift primary user interface to platformers.

Present

User contact

Service designed by **automakers**

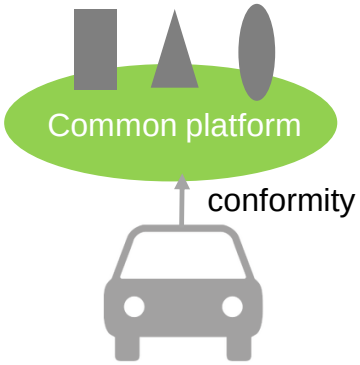


Users

Connected Cars

Service provider = applications firm (UBER)

User contact

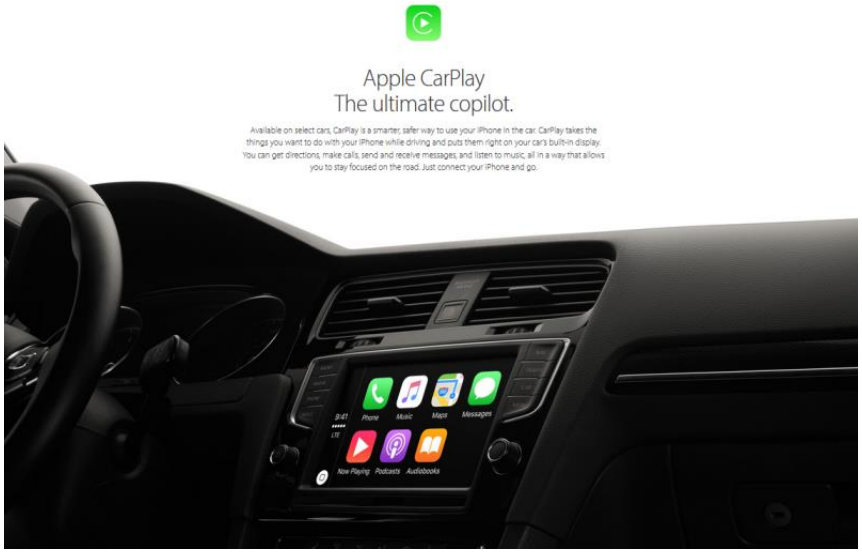


Service designed by **platformers**

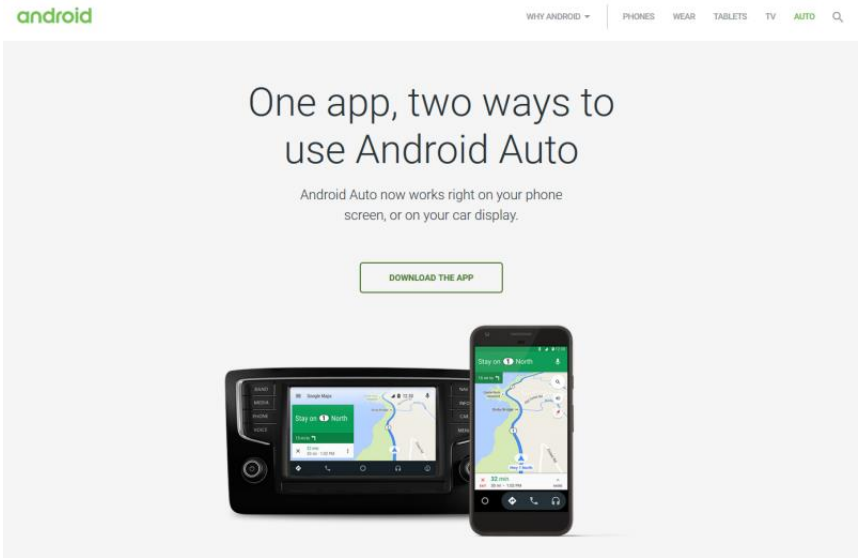
The key is how to connect with players holding the primary user contact.

IT giants are attempting to enter into the common platform.

Since 2014, IT firms have climbed onboard with in-vehicle apps;
Apple with Car Play and Google with Android Auto



Source：Apple website

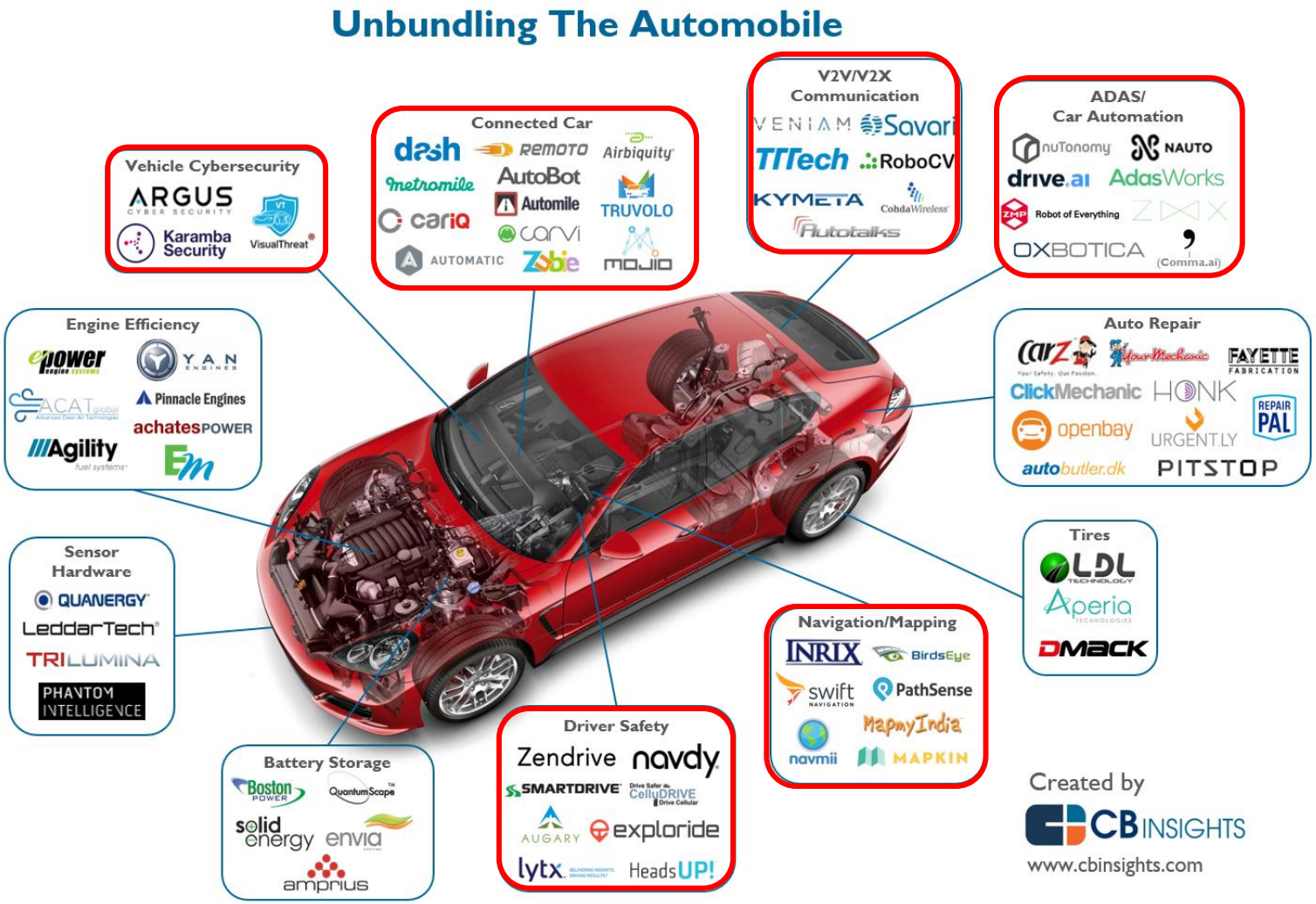


Source：Android website

AMAZON offers voice platform Alexa, which was found in 700 products introduced in CES2017. Automakers like Ford has announced putting Alexa in their cars as well.

Source：Ford website

The number of startups entering the industry may increase considerably as cars become a connected device.



2-2. Opportunities (Connected)

Mr. Naoki Sugimoto
Honda R&D Innovations, Inc. CEO

"A possible bold business model is for Tier1 and Tier 2 firms to become platformers rather than suppliers, distributing free onboard devices and car OS, and profiting from their services and applications."

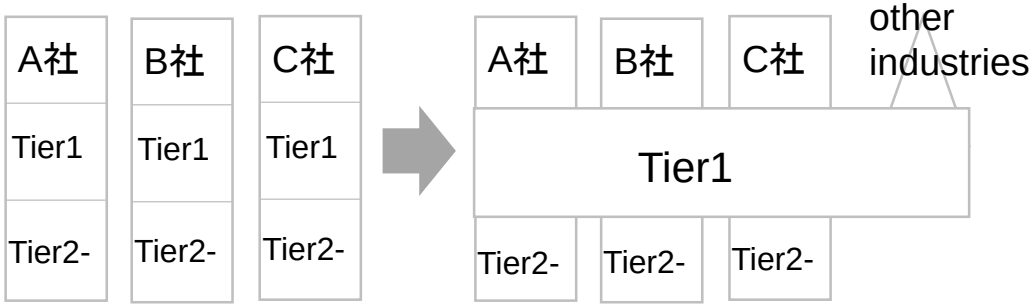
"Electrification means changing from "Interdependent" to "Modular." Electric parts are highly versatile, so it may be an opportunity to sell them openly."

Mr. Hiro Saijo
Yamaha Motor Ventures & Laboratory Silicon Valley Inc. CEO

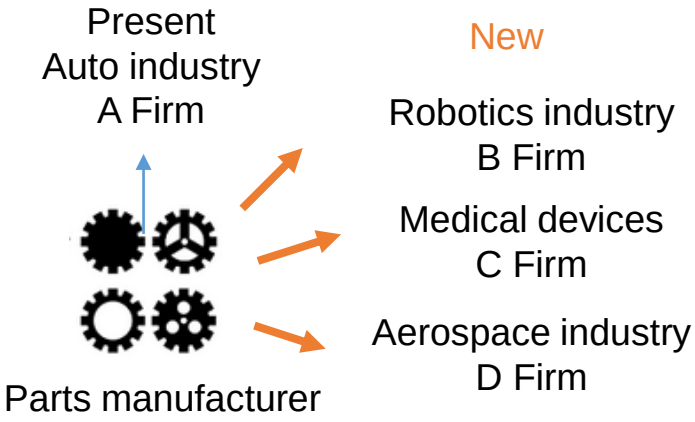
CEO, Auto Company

"For Japanese suppliers, especially software suppliers, the key is to become "open." Google is succeeding in having Facebook and Snapchat create its services. It is also a possibility for Tier1 and Tier2 suppliers to offer a common platform for OEM."

- **Tier1 may turn into a platformer (conceptual diagram)**



- **open transactions for parts**



2-3. Electric Vehicles (EV)

2-3. Tesla's popularity

- Top seller in the U.S.'s luxury car market by far.
- Tesla's sales at approximately 80,000 cars. (2016)
- The most recent Model 3 is reported to have already received around 40,000 pre-orders. (Jan. 2017)

U.S. Large Luxury Sedans

MODEL	Q3 2016	Q3 2015	% Change	% of Total
Tesla Model S	9,156	5,756	59%	32%
Mercedes-Benz S-Class	4,921	5,414	-9%	17%
BMW 7-Series	3,634	1,140	219%	13%
Mercedes-Benz CLS-Class	1,983	1,815	9%	7%
Maserati Ghibli	1,541	NA	NA	5%
Audi A7	1,532	2,132	-28%	5%
Lexus LS	1,235	1,569	-21%	4%
Porsche Panamera	1,143	1,393	-18%	4%
BMW 6-Series	1,096	834	31%	4%
Audi A8	1,010	1,300	-22%	4%
Jaguar XJ	903	1,064	-15%	3%
Maserati Quattroporte	702	NA	NA	2%
Total	**28,856**	**22,417**	**29%**	**100%**

Source: Tesla internal sales data and competitor information compiled by the automaker.

Tesla Model S

2-3. The value of EV

EV's value lies in reduced emission, commoditization of cars, and low infrastructure costs.

Reduced emission

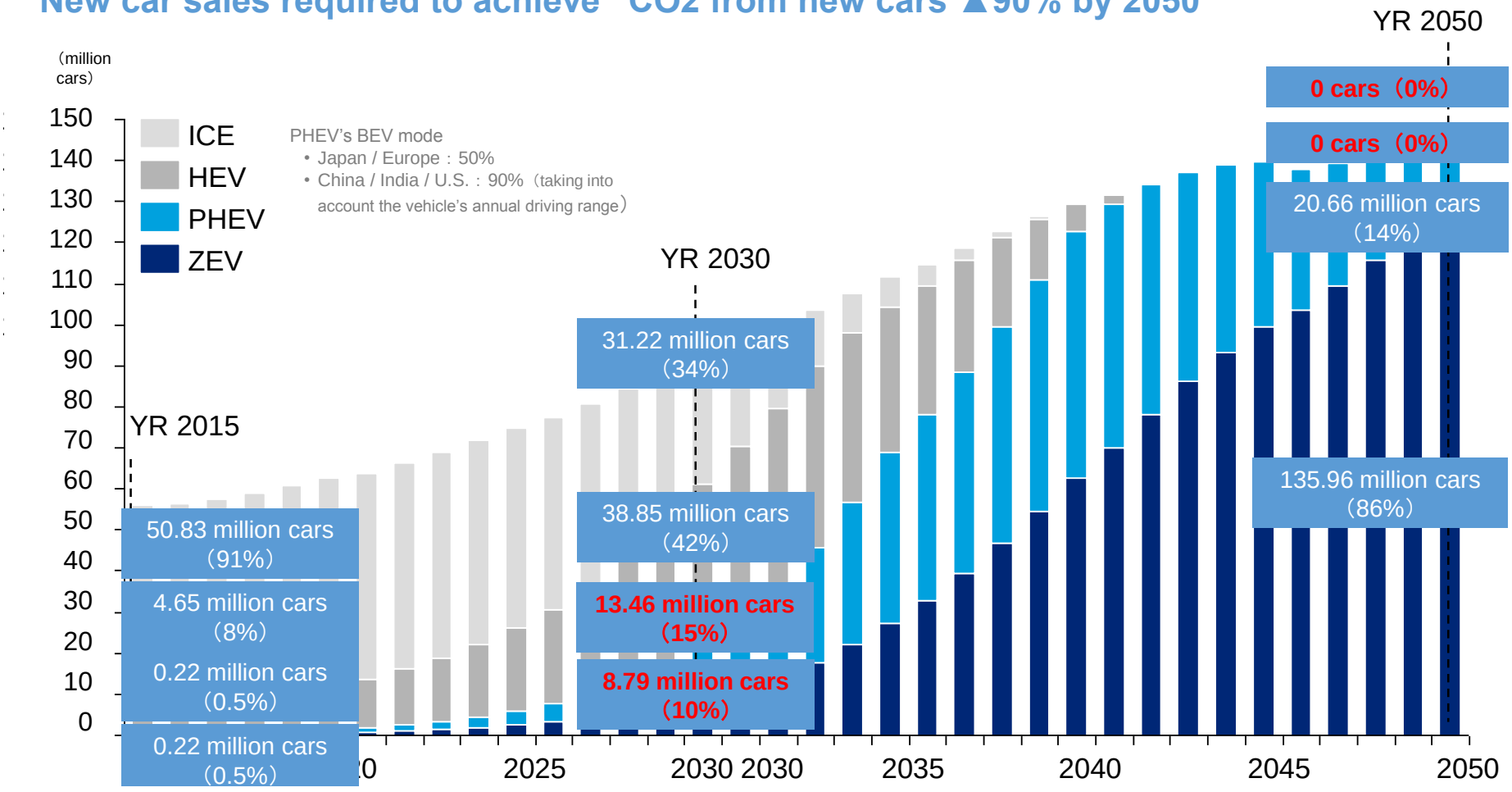
Commoditization

Low infrastructure costs

2-3. Conventional EV distribution scenario

PHEV+EV: Year 2030: 25% → Year 2050: 100%

New car sales required to achieve “CO2 from new cars ▲90% by 2050”



Source : Deloitte Tohmatsu Consulting as of 2015

2-3. OEM strategies to reduce CO2

Leading OEM executives in Japan, U.S., and Europe have all publicly announced their determination to reduce CO2.
It is possible that progress toward zero emission may be speedier than ever.

Daimler

EV will account for 15-20% of new car sales in 2025

Thomas Weber
Daimler
Former Adviser

Between 2014 and 2015, we cut our fleet average by 6 grams to 123 g/km. Our target for the MBC fleet in Europe is around 100 grams. We will steadily increase the percentage of electric vehicles in our fleet to reach this target. **Electric mobility at Daimler will be in the six figures by 2020.**
(from Daimler Global Media Site)

GM

Sharply reduce GHG emissions worldwide

Mary Barra
GM
CEO

Our customers expect us to help mitigate, (omitted) **sharply reduced our energy intensity, resource consumption and greenhouse gas emissions worldwide.**
(from Green Car Congress(Sep. 2014))

BMW

Our vision is to achieve completely CO2-free vehicle production

Norbert Reithofer
BMW
Former CEO

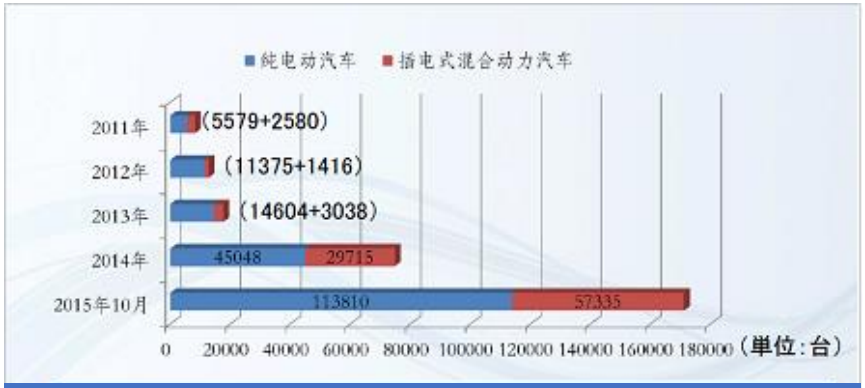
On our production lines we plan to reduce our resource consumption per vehicle 45 percent by 2020 compared to 2006. **Our vision is to achieve completely CO2-free vehicle production.**
(from BMW Sustainable Value Report 2013)

Source : Deloitte Tohmatsu Consulting as of 2017 Mar

2-3. EV promotion toward battling China's air pollution

- **China's emissions pose a serious problem. China is aiming for 5 million new energy vehicles by 2020.**
- **EV/PHV passenger car sales in China was 188,700 cars in 2015 (up 233% over previous year), overtaking the lead over U.S. at 116,000 cars.**

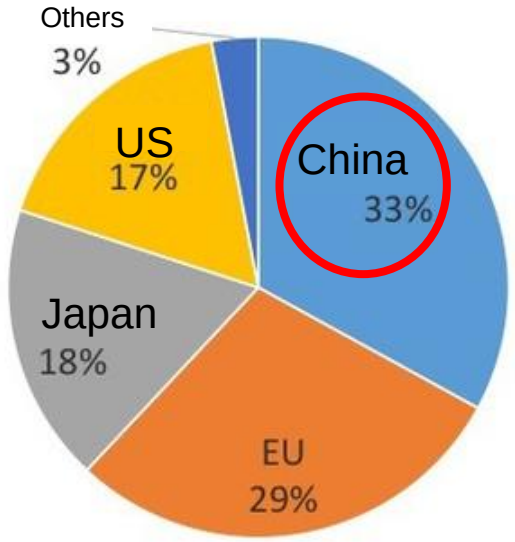
Sales of new energy vehicles by year (2011～2015)



Sales of new energy vehicles has shown explosive growth since 2014, looking toward exceeding 200,000 cars in 2015.

（Source）Next Generation Vehicle Promotion Center
http://www.cev-pc.or.jp/town/china.html、

Diagram Share of EV/PHV manufacturers by country

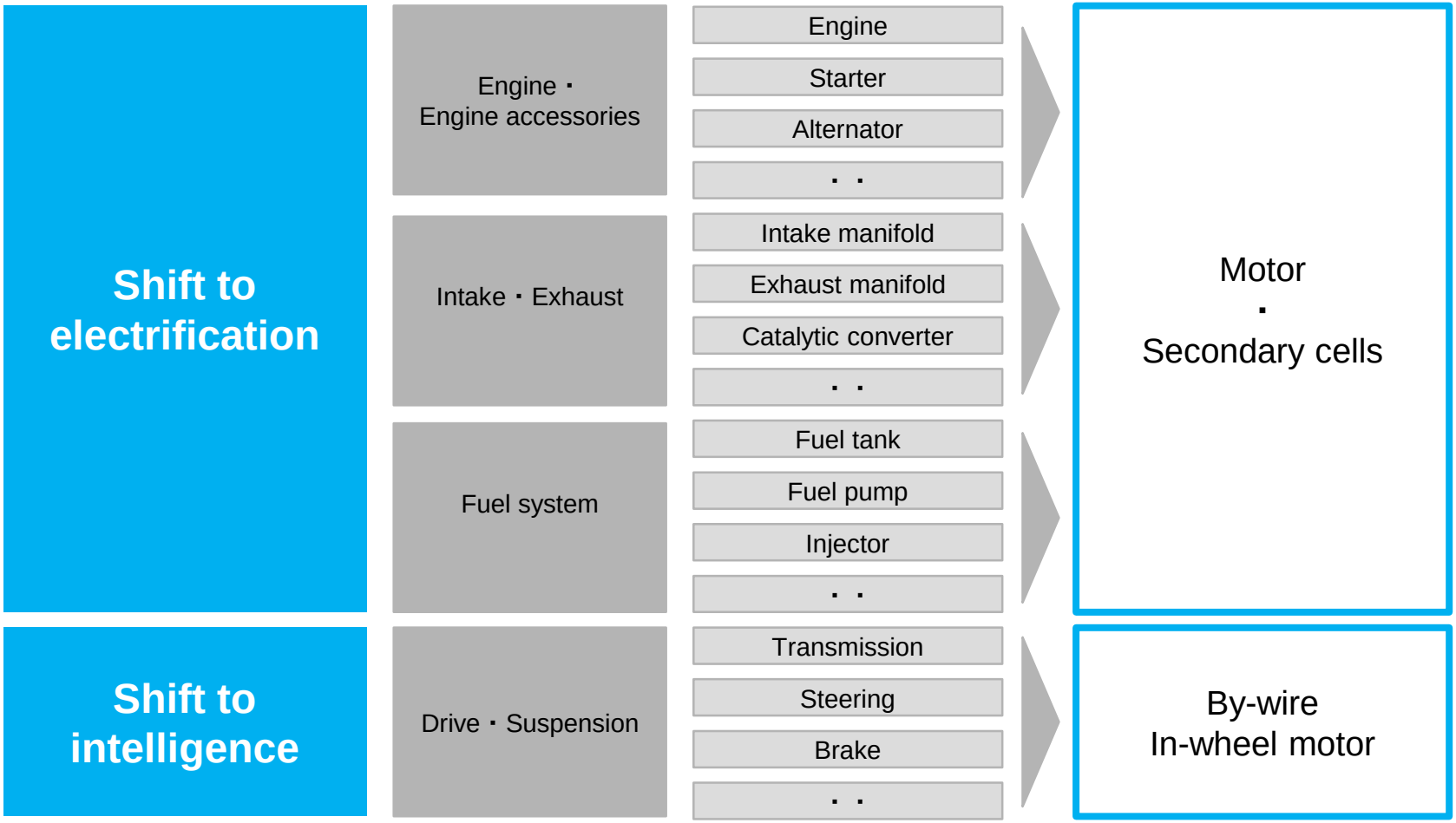


Data from 2015 Source:

（Source）「China, the world's new leading NEV country （Ryuzo Yamamoto）
http://wedge.ismedia.jp/articles/-/6738?page=2

2-3. Fewer parts due to electrification

Some parts vanish, and some new parts become necessary as cars shift toward electrification and higher intelligence.



Source：Nikkei Business Publications “Mobility Revolution 2030　Disruption and Revolution of Auto Industry”

Number of engine parts: 10,000～30,000 parts

⇒ Number of electric motor parts: 100 parts (including inverter)

Source: All about, Electric Vehicles are Changing the Industry Structure, Tokushi Nakashima

Prof. Schumpeter Tamada
Research fellow at the Research Institute of Economy, Trade, and Industry (RIETI)
Kwansei Gakuin University

"With fewer mechanical systems, Japanese craftmanship in assembling adjustment is no longer an advantage.
⇒ No more need for *keiretsu* transactions."

Mr. Tak Miyata
Scrum Ventures
Founder & General Partner

"Cars can be assembled by firms other than the existing OEMs as well.
⇒ Xiaomi and Didi have began developing cars."

With electrification, there will be an increased demand for batteries, motors, and inverters.

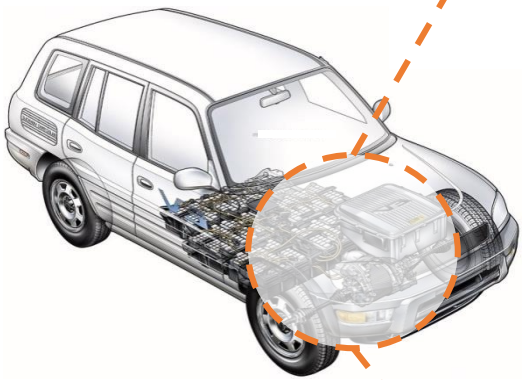
Key parts no longer needed in EVs

engine

Gas tank

マフラー

fuel injection system



Key parts newly required for HV/EV

Battery

- Electrical storing device
- The battery's energy density (electrical storage capacity) determines the driving range for HV/EVs.
- The cost for battery manufacture will account for a large part of the cost required for the shift to HV/EV
- In addition, the power density which determines the power output, safety, charging time, and durability are also important factors to consider when making improvements to the batteries.

Motor

- HV/EV drive system, that converts electricity to automotive power.
- The motor output determines HV/EV's acceleration (equivalent to engine's horsepower)
- Downsized motors will reduce auto weight and expand the driving range, as well as give greater degree of freedom in vehicle design.
- By attaching a motor to each wheel, it becomes possible to improve the maneuverability of the vehicle as well as give greater degree of freedom in vehicle design.

Inverter

- Electronic device that changes the direct current (DC) taken out from batteries to alternating current (AC) which can then be used for motors.
- It is possible to regulate the speed of the AC motor via controlled frequency and voltage. An ECU (energy control unit) for this purpose is contained inside the inverter unit.
- Improved inverter conversion efficiency will be reflected in expansion of the driving range.
- Downsized inverters will reduce auto weight and expand the driving range, as well as give greater degree of freedom in vehicle design.

Source：Deloitte Tohmatsu Consulting

2-3. Tesla's ambition

Elon Musk, CEO, Tesla

- From "Tesla Motors" to "Tesla"
- Tesla isn't just building cars, but will create, store, and distribute solar power.
- We will supply more batteries at increasingly affordable prices through our "Gigafactory."

Source: Bloomberg

Source : Tesla website

2-4. Autonomous Driving

2-4. A city with autonomous vehicles

- It is not uncommon to see an autonomous vehicle running the streets of Silicon Valley.
- Public-road testing became possible from 2012.
- Waymo has already travelled 3.6 million kilometers, as well as 1.6 billion simulated kilometers. It has also driven guests on 10,000 occasions (as of December 2016).
- IT firms have started developing self-driving systems.

Source: Waymo website

WAYMO

UBER

2-4. Self-driving pilots becoming widespread

- OTTO, bought by UBER, performed a self-driving truck (Level 4) delivery of 50,000 beers over a distance of 190km (120 miles), which included driving along a Colorado highway. (Oct. 2016)
- There is currently a shortage of 48,000 truck drivers. The shortage is expected to grow to 175,000 in 2024. (American Trucking Associations)

OTTO

Jan. 2016: Founded
Aug. 2016: Acquired by UBER
Amount paid for acquisition:
Approx. 77 billion yen
Employees: 90
Products:
Self-driving systems for trucks

Source: WIRED 「Uber's Self-Driving Truck Makes Its First Delivery: 50,000 Beers」 2016.10.25

2-4. The value of autonomous driving

The value of autonomous driving lies in reduced number of accidents, liberation from driving, and serving as means of mobility to the elderly and the children.

Reduced accidents

Liberation from driving

Mobility for elderly and children

2-4. Autonomous driving goals for automakers

In addition to conventional automakers, IT firms like Waymo and UBER, as well as Chinese firms like Baidu have all set out ambitious goals for autonomous driving.

*"fully automated" refers to automated driving Lv.4（Lv.5 for TESLA）

Ford	Will deploy fully automated sharing vehicles by 2021.
GM	Will complete fully automated vehicles by 2020.
TESLA	Will enable fully automated driving (Lv.5) from LA to NY in end of 2017.
Volkswagen	Will start sales of the first fully automated vehicles in 2019.
BMW	Will start sales of fully automated Evs in 2021.
Baidu	Will start mass production of automated vehicles (Lv.3) in 2019, and fully automated vehicles in 2021
UBER	Will deploy fully automated Volvo vehicles by 2021
TOYOTA	Will enable practical application of fully automated driving on highways in or around 2020.

D-Lab survey based on firms' press releases (Feb.2017）

2-4. Different approaches to technology development

Tesla

- **Incremental improvements**, and update software.
- Has collected 1.25 billion km (780 million miles) worth of automated driving data over the past 18 months. (May 2016）
- Adds another 1.6 million km (1 million miles) worth of data every 10 hours.
- Has already added necessary sensors for Lv.5 (8 cameras, 12 ultrasonic sensors. Awaiting software update.

WAYMO

- **Going straight to Lv. 4 , Lv.5**
- No hardware, focusing only on software. It aims to deliver to hardware manufacturers.

Comma.ai

- George Hotz, with a genuine talent at hacking, built an after-market highway self-driving car kit on his own.
- Attempts to sell his first product (Comma One) at U.S.$1000, but receives massive amount of questions from the regulatory authority which led him to cancel his product. (2016.11.6)
- Instead, he opts to release his self-driving software “Open Pilot” as an open source, and plans for compatible hardware “Comma Neo” **available for free.** (2016.11.30)

→ Later an MIT student used the open source and succeeded in autonomous driving

Source: QUARTZ「Tesla has 780 million miles of driving data, and adds another million every 10 」(2016.5.28)
The Bridge ”Genius Hacker George “Geohot” Hotz’s start-up Comma.ai open sources its self-driving kit”(2016.12.10)

2-4. Deregulating competition

- The State of Michigan announced that it will allow taxis without steering wheels or pedals.
- Detroit is angling to keep Silicon Valley's hands off its Motor City title.

- US Department of Transportation enthusiastic toward adopting autonomous driving

"The fact of the matter is 75% of all the companies that are doing research and development in this space are in southeast Michigan!"

Michigan
(2016.12)

"The number of traffic accidents are increasing because people use their smartphones while driving. It is unrealistic to stop using smartphones completely so we expect that autonomous driving technology will reduce the traffic accident."

Dr. Stephen Zoepf
Executive Director
of CARS

Source: WIRED「Michigan Just Embraced the Driverless Future」(2016.12.9)

2-4. Deregulating competition

UBER, as soon as its testing of self-driving cars in San Francisco gets banned by California regulators, the company gets an invitation to test in Arizona.

"UBER should stop testing self-driving cars right away, since it has not obtained proper permission!"

California （2016.12.21）

"Arizona welcomes Uber self-driving cars with open arms and wide open roads. While California puts the brakes on innovation and change with more bureaucracy and more regulation, Arizona is paving the way for new technology and new business."
"California may not want you, but we do."

Arizona Governor Doug Ducey

（2016.12.22）

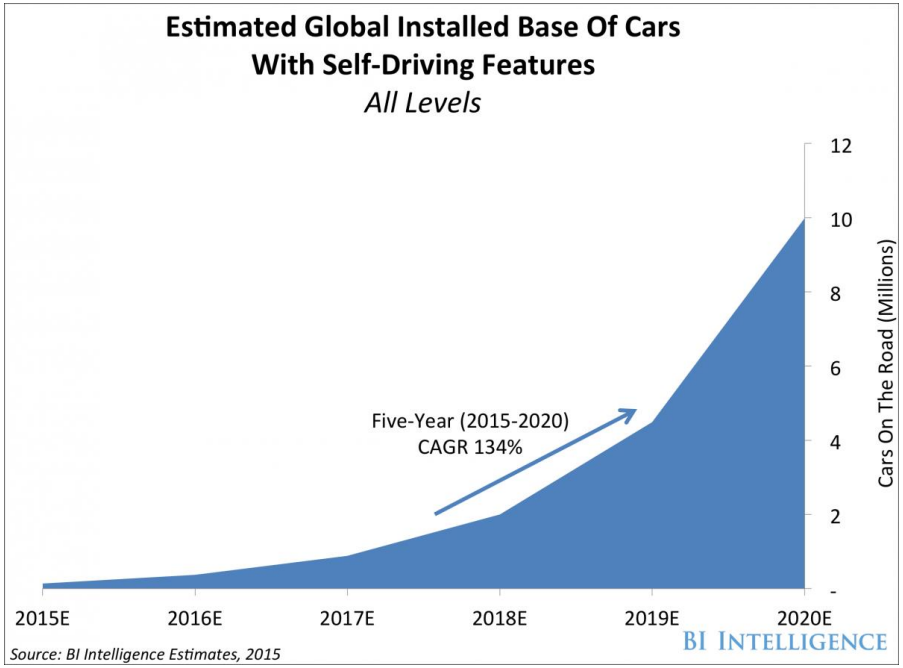
2-4. Estimate of self-driving cars on the road

- Ten million self-driving cars will be on the road by 2020, with features that allow it to accelerate, brake, and steer a car's course with limited or no-driver interaction. Source： BI Intelligence
- Of all distances travelled by cars, autonomous driving will account for 33% by 2030. Source：Ministry of Land, Infrastructure, Transport and Tourism, estimates for Tokyo

(* Annual average mileage for self-driving cars calculated using average speed (36.4km/h or 22.6 miles/h) of cars in Japan, and taxis' operation rate calculated as the total mileage covered with passenger divided by total mileage covered (43%) in Tokyo, and assuming that taxis are in operation 24 hours/365 days)

"Once deregulated, the age of self-driving cars will take off."

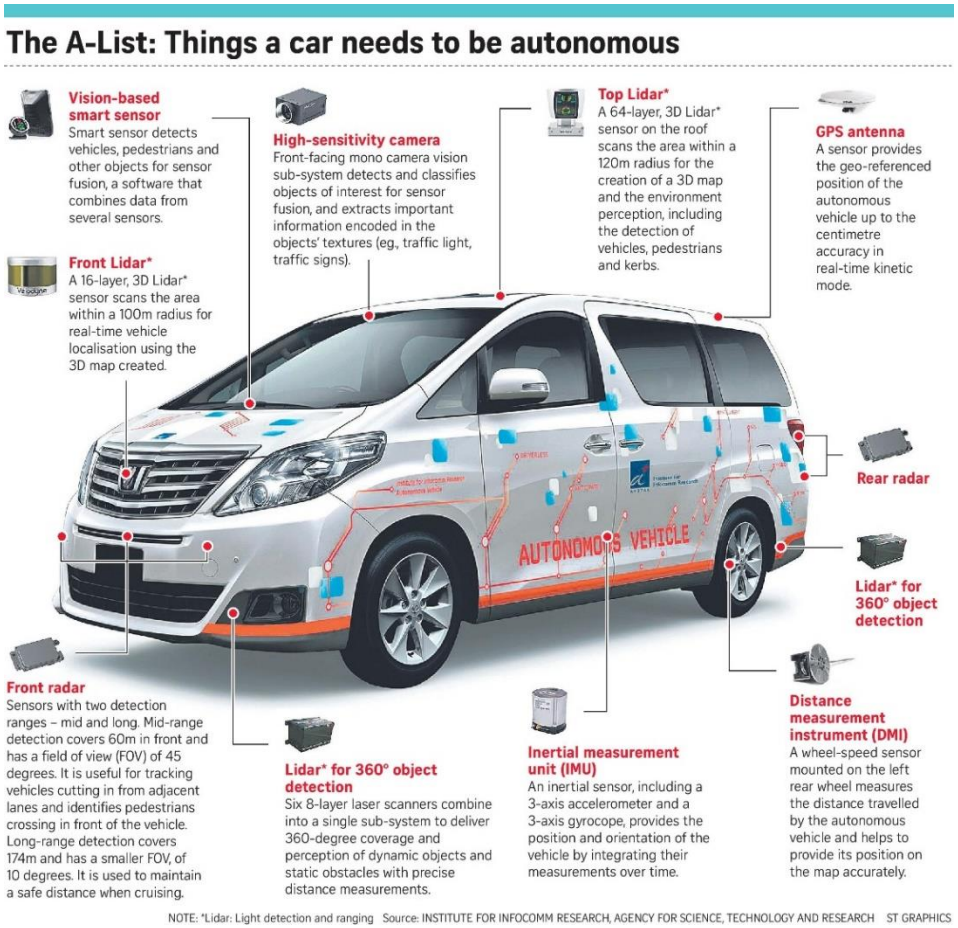
Prof. Schumpeter Tamada
Research fellow at the Research Institute of Economy, Trade, and Industry (RIETI)
Kwansei Gakuin University



Source:The Business Insider「10 million self-driving cars will be on the road by 2020」(2016.6.15)

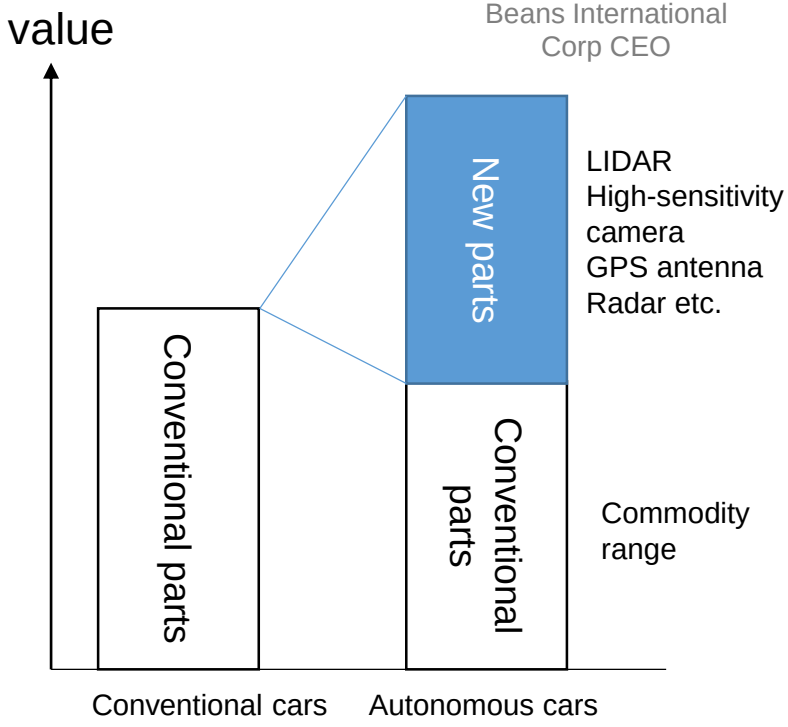
2-4. Opportunity for autonomous driving parts

Conventional parts will lose value, while demand for new parts will increase.



Source: iiRAV website

Mr. Yoshi Engo
Beans International Corp CEO



Conceptual diagram

Startups entered into core parts market

- **LIDAR for autonomous driving**

Velodyne
(U.S.$30,000~40,000)※

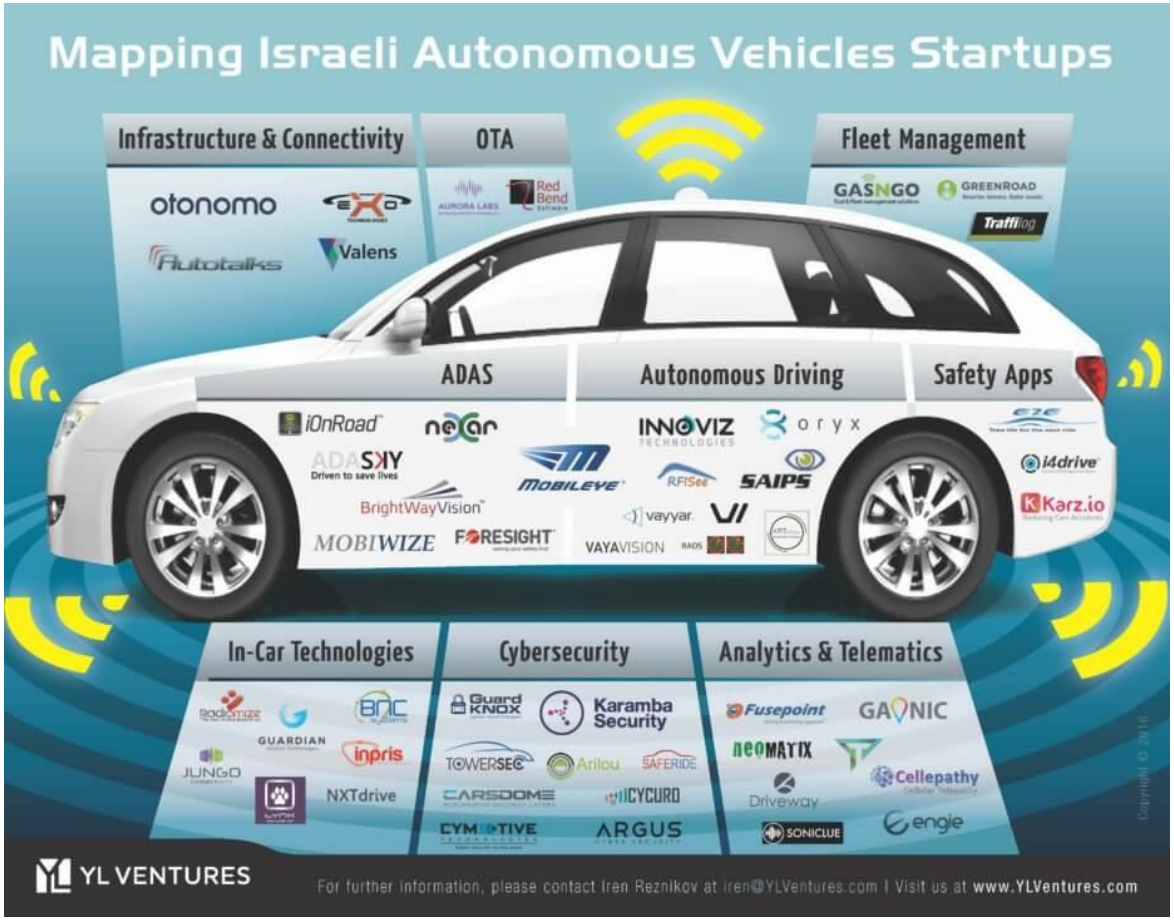
Source: Firm websites

Quanergy Systems
(U.S.$150) As of Mar.2017

M8-1 LiDAR Sensor

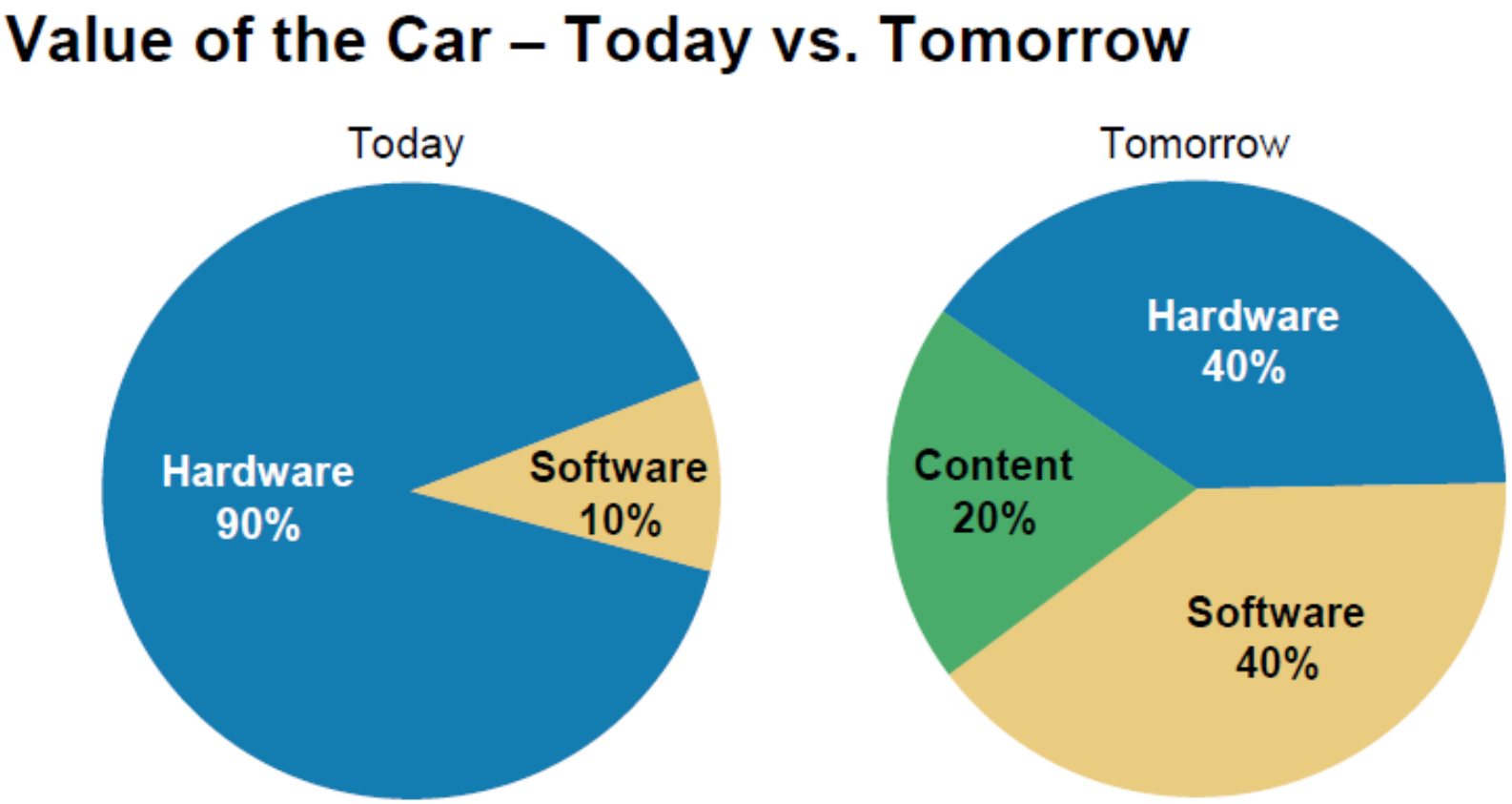
Publicly announced that the cost will be less than U.S.$100 by 2018

Israeli autonomous vehicles startups exist as many as shown below.



Source: Venturebeat「Israeli startups deliver much-needed tech for self-driving cars」(2016.12.10)

Value of autonomous driving enables software rises, as hardware value drops in comparison.



Source: Morgan Stanley “Autonomous Cars, Self-Driving the New Auto Industry Paradigm” 2013.11.6

2-4. What autonomous driving brings

Steering wheels and pedals may no longer be needed, and "drivers" as well. But in addition, the following impact may also become visible.

Drive time may turn into leisure.
(average round-trip time is 1hr.)

Source:Formtrends「driverless car design sleepwalking into the future」

"We will start the competition regarding in-car entertainment."

CEO, Auto Company

Less accidents leading to diversifying safety standards.

"Vehicle body made of resin may suffice."

Mr. Naoki Sugimoto
Honda R&D Innovations, Inc. CEO

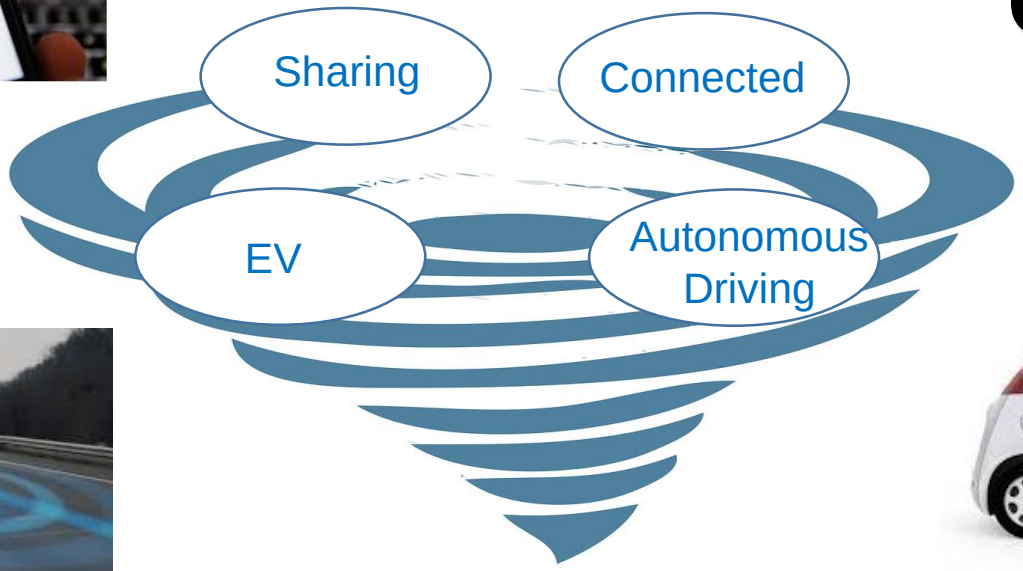
3

Disruptive impact hitting the auto industry

There are 4 simultaneously occurring waves:
Sharing, Connected, EV, Autonomous Driving

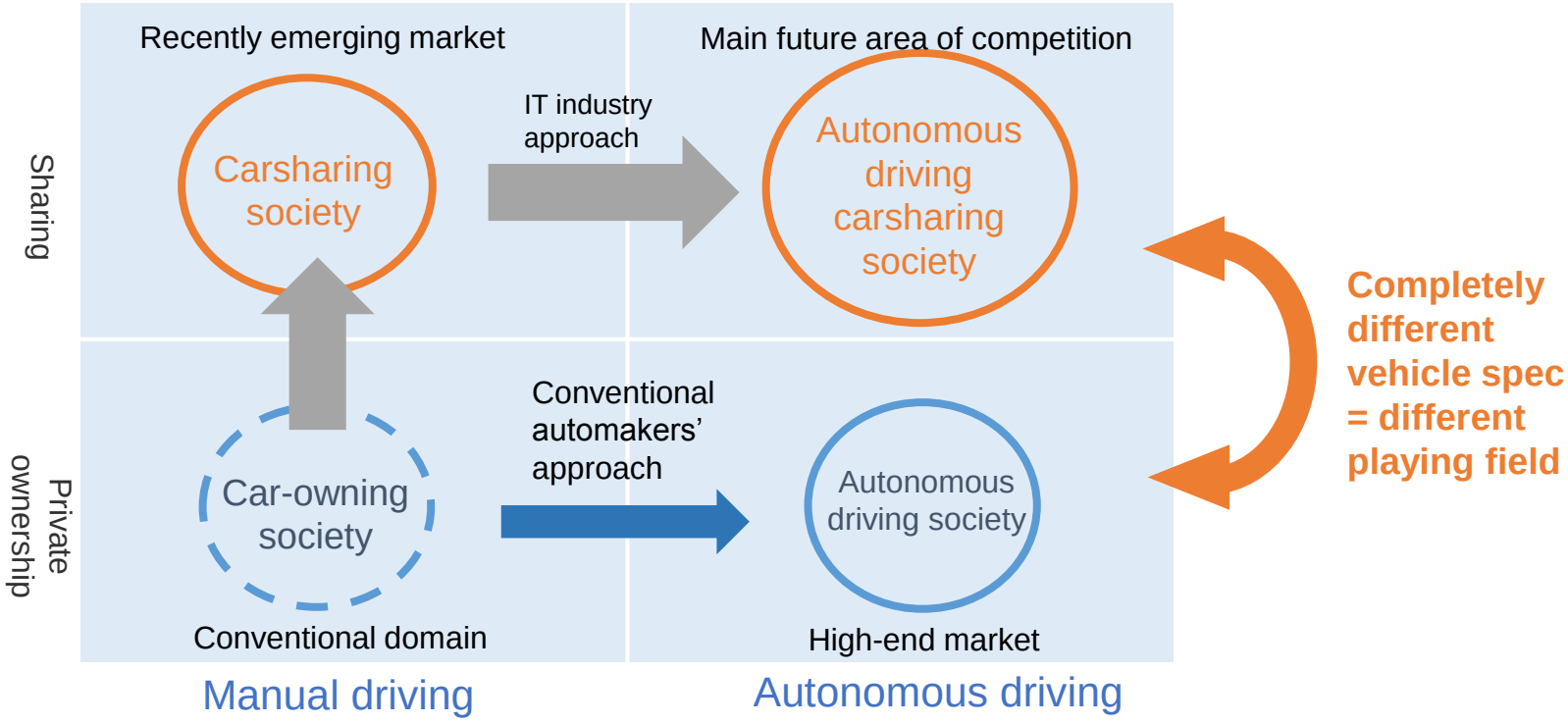
Mr. Tak Miyata
Scrum Ventures
Founder & General Partner

Google



Silicon Valley

Difference in approach toward autonomous driving and sharing between conventional and IT industry.



Silicon Valley D-Lab analysis

Prof. Schumpeter Tamada
Research fellow at the Research Institute of Economy, Trade, and Industry (RIETI)
Kwansei Gakuin University

"IT firms and automakers are looking at different markets."

3-1. Understanding the aim difference (Silicon Valley D-Lab analysis)

"It is important to understand what is at the eye-level of Silicon Valley players, and to directly face what is occurring in the world."

Mr. Tak Miyata
Scrum Ventures
Founder & General Partner

Aim (in general theory)

Conventional auto-related industry

Connected	Improved vehicle performance, cloud service
EV	Lower emission
Autonomous driving	Fewer accidents, improved vehicle performance

UBER

Sharing

Aim to become the driving force for the next auto industry

EV

Autonomous driving

Diversification of suppliers for affordable cars, as cars are commoditized.

Solves driver Shortage, Bottleneck removed

Google/Waymo

Autonomous Driving

Zero accidents
Offering autonomous driving software (Shifts competitive power source from hardware to software.)

Connected

Sharing

Become common platformer for cars

Obtain user contact

TESLA

Connected

Obtain customer loyalty through UX equal to smartphones

EV

Autonomous driving

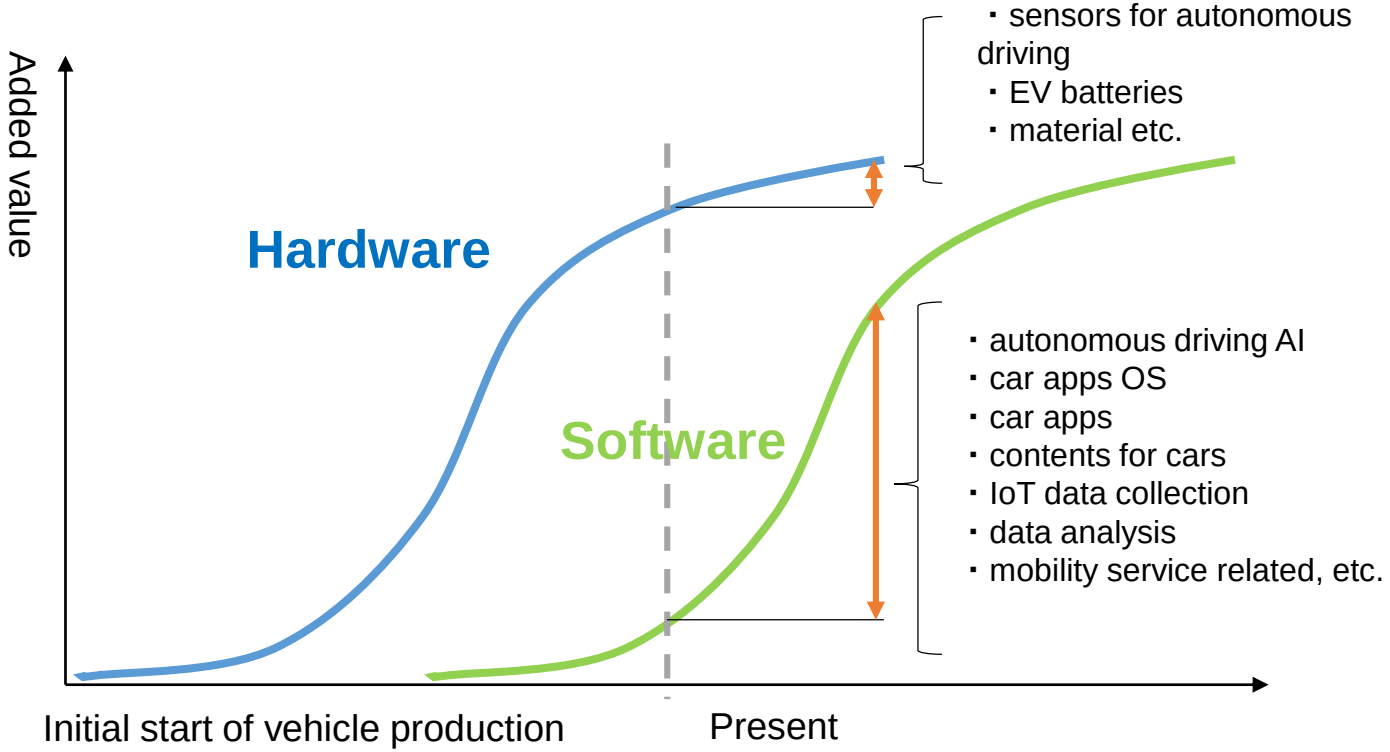
Establish own ecosystem for clean energy

Securing early adapters

3-2. From hardware to software (conceptual diagram)

“Software has a greater potential for growth.”

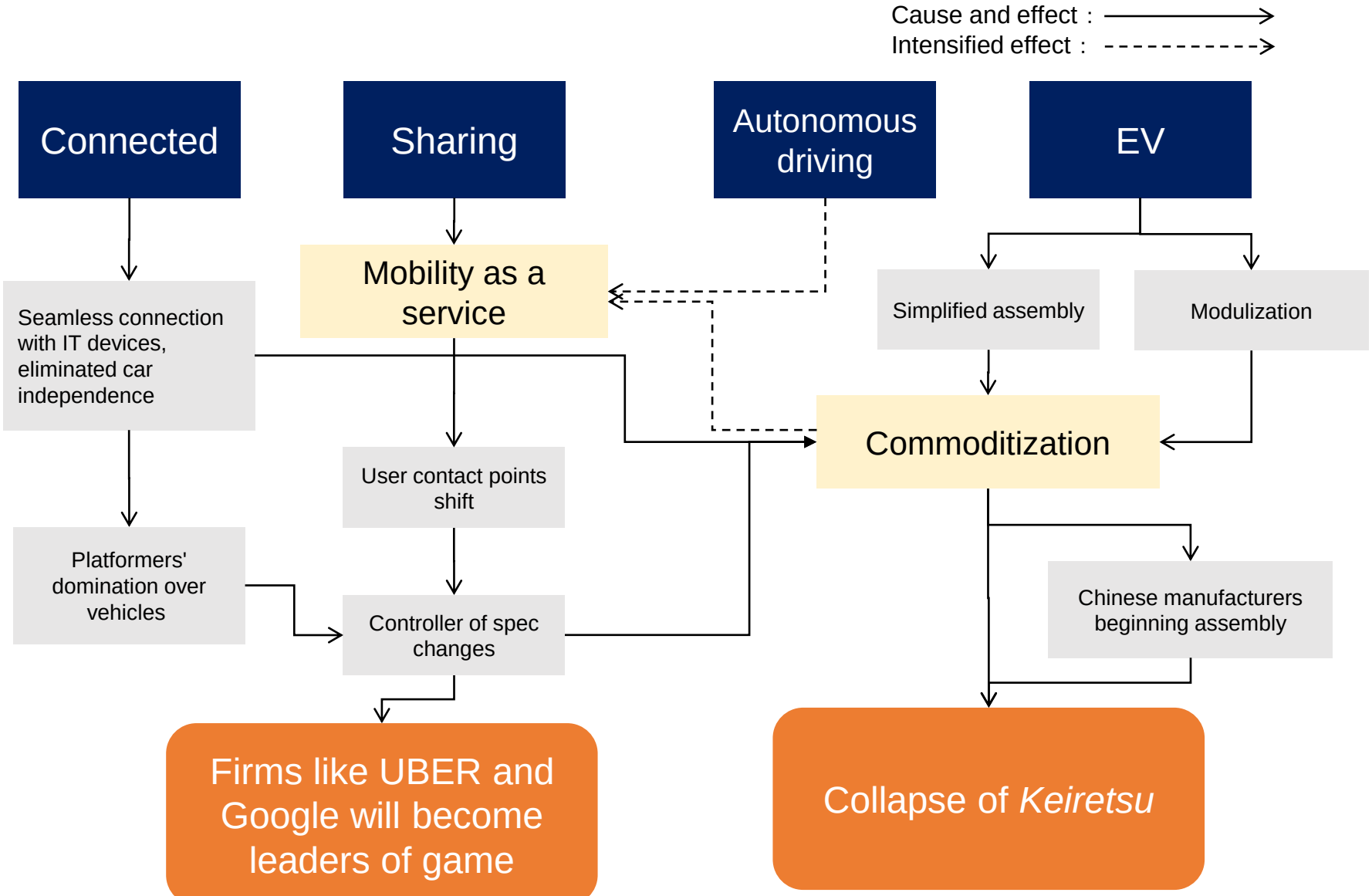
Mr. Naoki Sugimoto
Honda R&D Innovations, Inc. CEO



Mr. Hiro Saijo
Yamaha Motor Ventures & Laboratory Silicon Valley Inc. CEO

“Potential growth for hardware is small but huge for software. Therefore, product design allows both to be updated is getting more important to enhance user experience.”

3-2. Auto industry's innovative change process (possible scenario)

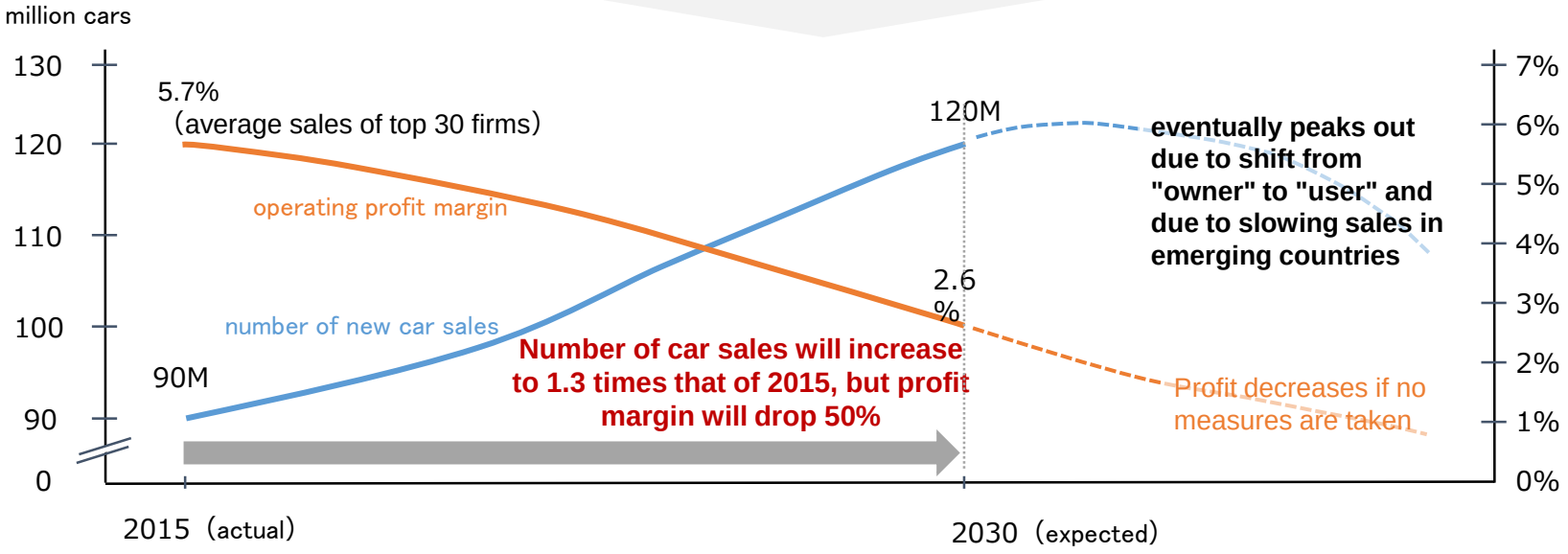


Silicon Valley D-Lab analysis

Risk of 50% drop in profit margin

Change in segment mix (increase in compact cars)	- Shift from profit-generating fleet cars to low-revenue compact cars - Drop in sales due to lower unit price, accompanied by drop in revenue
Increased electrified vehicles	- Increase of electrified vehicles using more expensive parts and systems compared to internal-combustion engines - Drop in revenue due to increased development/manufacturing cost (assuming that increased cost cannot easily be shifted to vehicle sales price)
Increased autonomous driving vehicles	- Increased cost due to increased number of autonomous driving vehicles which require expensive parts and systems - Drop in revenue due to increased development/manufacturing cost (assuming that increased cost cannot easily be shifted to vehicle sales price)
Impact of car sharing	- Decreased demand for private cars due to a shift in consumer needs from "owner" to "user." - Decreased sakes due to decreased demand, accompanied by drop in revenue

Relationship between sales of whole vehicle manufacturer and revenue



Source: Nikkei Business Publications "Mobility Revolution 2030 Disruption and Revolution in the Auto Industry"

The industry supporting Japan's "*monozukuri*" may fade

- Number of firms in Tokyo's Ota City and Higashiosaka City have halved in later years after entering the 2000s.
- This is due to an accelerated shift toward overseas production by manufacturers of finished products / slumping business of electronic firms.

(Ref.) Decline in number of firms

Ota City, Tokyo	1983	2008
	Approx. 9,000 firms	Approx. 4,000 firms ↘
Higashiosaka City	1997	2007
	Approx. 12,000 firms	Approx. 8,000 firms ↘

Source: Deloitte Tohmatsu Consulting

To prepare for the next wave, it is important to consider how parts manufacturers and material supplying firms may stay in business.

"For instance, a Japanese cell phone parts manufacturer was able to survive the smartphone revolution because it kept its "eyes on the customers." It dealt with the situation by watching its ultimate users, and that was what kept them in business."

Mr. Hiro Saijo
Yamaha Motor Ventures & Laboratory Silicon Valley Inc. CEO

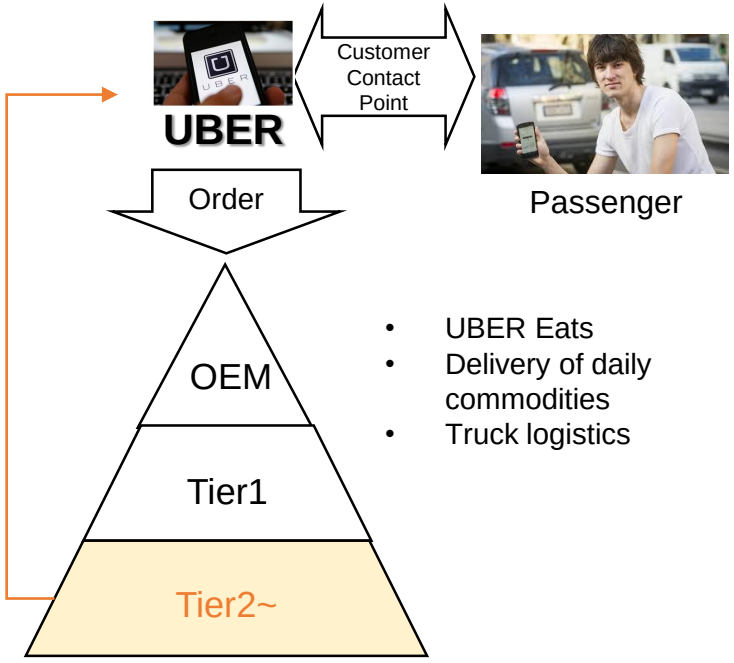
The key is to determine who to watch, and whether the firm can take the proper next step.

3-3. How to survive in the future car business

①Have antennas ready to catch the movements of rideshare firms（UBER, etc.) and platform firms（Google, etc.）.

（conceptual diagram for a possibe scenario）

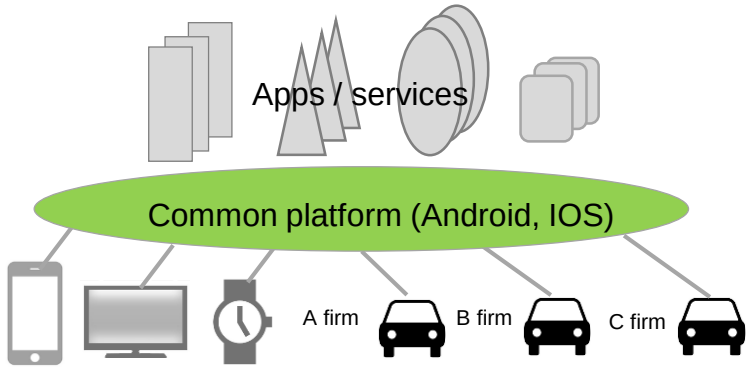
Keep watch on rideshare firms



- UBER Eats
- Delivery of daily commodities
- Truck logistics

Continue to accurately grasp the moves of firms that hold user contact points, such as UBER.

Keep watch on platform firms



What happened with smartphones

・terminals and buttons suddenly disappear or undergo change

・service policy changes (no longer free)

⇒Specs determined by Google, Apple

Continue to accurately grasp the moves of platformers such as Google.

・Understand their purpose and agenda.
・Look for your next partner
・Consider new business oppportunities for one's own products.

1. Visit Silicon Valley, and consider entry
2. Participate in events featuring Silicon Valley's key figures.

3-3. How to survive in the future car business

② Profit through service (Ex：Shifting to IOT)

"IOT parts：We will need to continue collecting data after the sale, to research and improve how they are used."（Example of GE's engine）

Dr. Stephen Zoepf
Executive Director of CARS

"Sensor systems like Lidar are very expensive. Current car use the 5% of time, but as mobility service we will use 50% of time. We should consider the cost per mile, we will be able to invest more money."

CEO, Auto Company

③ Join forces with other players

"Partnerships with IT firms or acquisitions will become key."

Mr. Tak Miyata
Scrum Ventures Founder & General Partner

"When placing primary focus on offering customer values and UX, it is better to have multiple firms collaborating / forming joint teams as opposed to working as independent firms."

④ Appy manufacturing technologies in a new field

- Japan's strength is in reliability, and ability to work hard to create difficult products
  Car-manufacturing technology can be applied to robotics and precision instruments
- Japan's manufacturing technology can be used in Silicon Valley's mass production of hardware.
- Move into field of public transportation where high reliability/durability is required
- Aside from cars, transportation of humans and goods may utilize the sky.

Mr. Hiro Saijo
Yamaha Motor Ventures & Laboratory Silicon Valley Inc. CEO

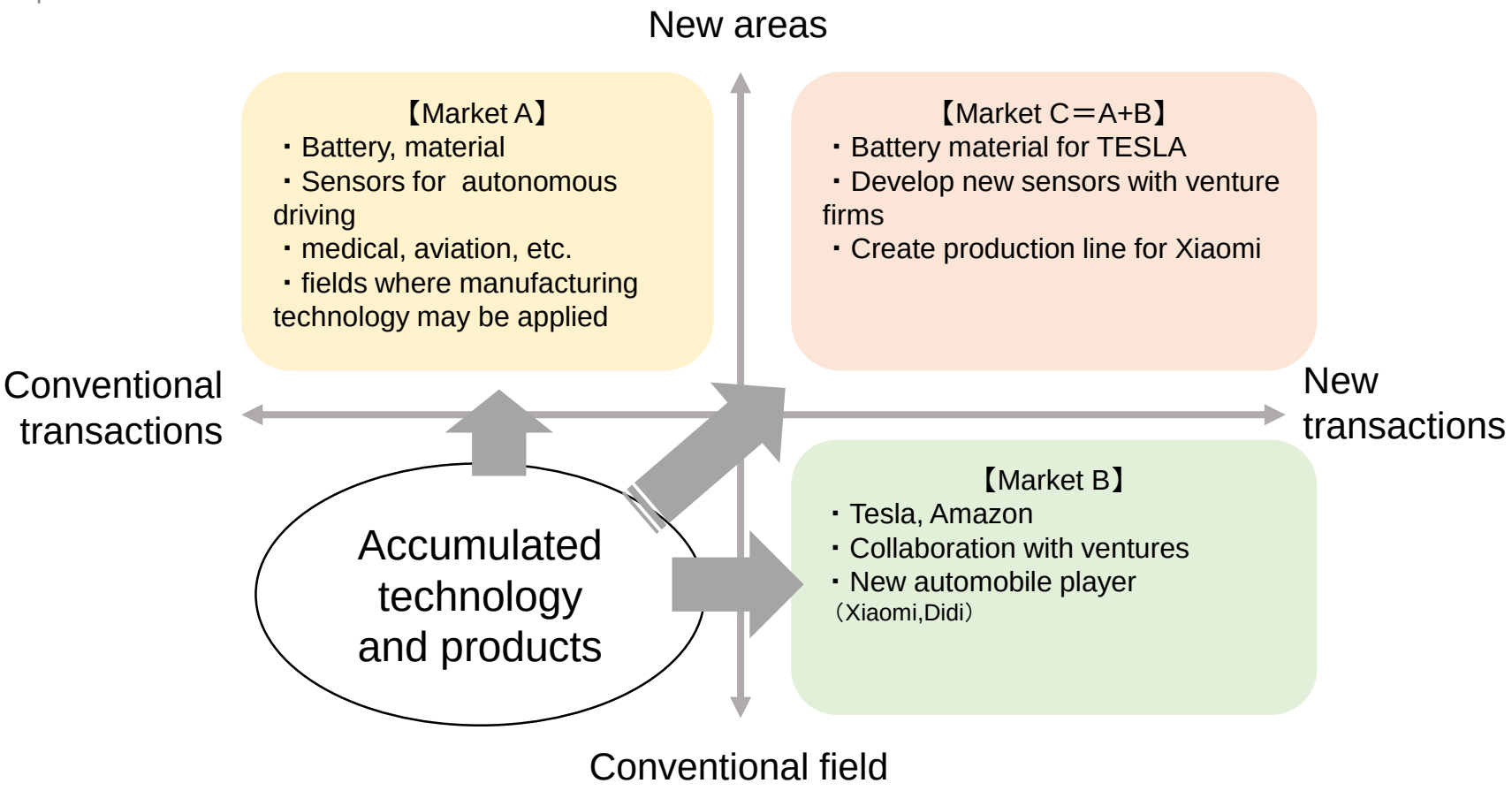
4

Business opportunity in the new era

4-1. Opportunity (product-selling business)(conceptual diagram)

Mr. Yoshi Engo
Beans International Corp CEO

"The Japanese skills and quality are indisputable. Yet, they are inferior in terms of speed and value. There are opportunities as long as measures are taken with a Market-in stance Japan still leads in battery, material, manufacturing technology."



4.1 Opportunity (product-selling business)(comments)

【Market A】 New field

Mr. Yoshi Engo
Beans International Corp CEO

"Great opportunity for EV-compliant batteries, motors, energy-saving/ clean technology manufacturing/ producing technology. Growing demand for car-mounted semiconductors and sensors."

"Japanese firms holds competitive edge in area of new materials used for electronic devices and medical devices, inclusive of manufacturing process. Great opportunities for medical devices, healthcare, robotics as well."

【Market B】 New transactions

"Get chances by inter-company collaborations."

CEO, Auto Company

Mr. Hiro Saijo
Yamaha Motor Ventures & Laboratory Silicon Valley Inc. CEO

'When placing primary focus on offering customer values and UX, it is better to have multiple firms collaborating / forming joint teams as opposed to working independently.'

【Market C＝A+B】

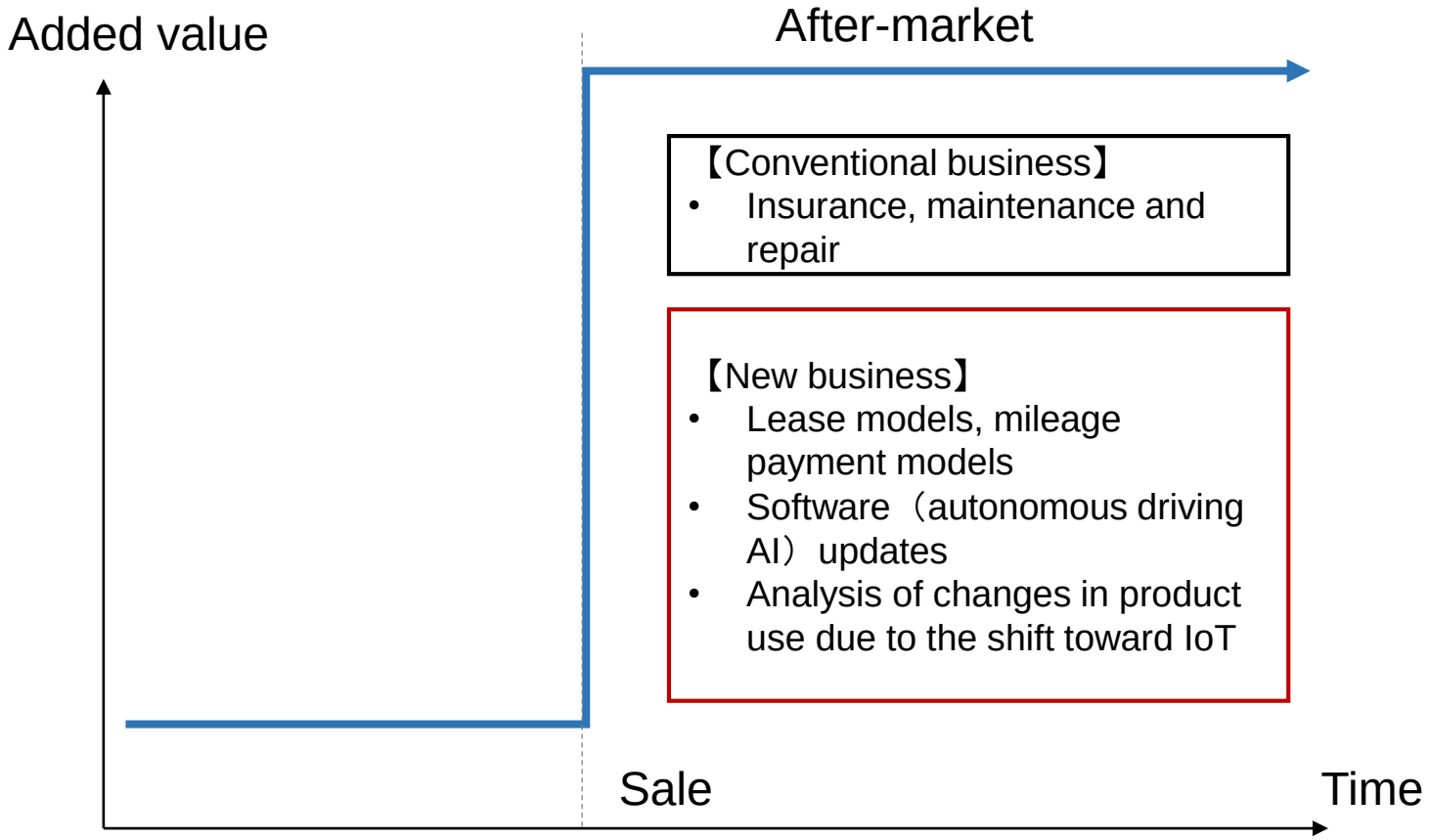
Mr. Hiro Saijo
Yamaha Motor Ventures & Laboratory Silicon Valley Inc. CEO

'Key factors to commodity cars are durability, reliability, and price. Car manufacturing technology can be applied to robotics as well as precision instruments.'

Mr. Yoshi Engo
Beans International Corp CEO

"Japanese firms have their assets accumulated over many years, which makes them capable of answering to the impossible demands. They also have price competitiveness as they have been squeezed for profit from business with large corporations."

4-2. Opportunity (service business) (conceptual diagram)



Dr. Stephen Zoepf
Executive Director
of CARS

"The other possibility is the airplane business model. We can change the components including the frame, material and sheet."

Prof. Schumpeter Tamada
Research fellow
at the Research Institute of
Economy, Trade, and Industry (RIETI)
Kwansei Gakuin University

"The key to survival for suppliers at the bottom layers is determining the needs of ultimate users, and being able to consider future cost reductions and/or added values in a long-term perspective."

Rather than focusing solely on making hardware, it is necessary to review alternative means from the user perspective

Past **Only one mean to provide user value**

User value

・mobility
・enjoy excursions
・transport baggages , etc.

means

Car ownership

Only one solution to the one value (1-to-1)

Gap between emerging needs and means.

Up to now, cars were defined and rules set to fit the lifestyle and society.
（＝1 car for high-speed transportation, everyday commute, and carrying baggage.）

Not in use 95% of the time (on average).

One commuter on a 4-seated car, cause for commute conjestion

Fuel consumption for transporting 2-ton vehicle for one commuter

After digitalization

Digitalization eliminated the distinction between manufacturing and non-manufactuing business, creating various new alternative means

Generation with new values and standards

Ownership＜＜on-demand

New means

Alternative means in urban areas = carsharing

In a digital society, disruptive innovation occurs from non-conventional players (non-manufacturers) providing alternative means for users from user-value standpoint.

Alternative means created in answer to user value

“Conventional hardware spec overshoots user value. It is now time to consider the essence of the issue (user value) rather than adding on excessive functions.”

Mr. Hiro Saijo
Yamaha Motor Ventures & Laboratory Silicon Valley Inc. CEO

Is there no other solution than for manufacturers to become service providers?
→ One stragegy is to differentiate hardware that is most optimal for the new service.

User value

New user value

	Means/Service	Required hardware
Past	Car ownership	Optimal car for commuting, vacation, and also for carrying baggage etc.
Present	Carsharing（UBER, etc.） Consider alternative means from user value perspective	Commodity cars exclusively for carsharing（low cost, trouble-free, replace in 2 years）
Future	Mobility in urban areas ＝＞Ex: dedicated low-speed carts	If dedicated to urban areas with average speed of 20km (12.4 miles) per hour or below, it will not require high-speed capabilities, and needs only limited self-driving functions and crash performance ⇒ **public low-speed autonomous carts designed for use by several people**
Future	Extraordinary experience =>Ex:Virtual Reality（VR）	Offer VR experience as an alternative to extraordinary experience. License-free, maintenance-free, accident-free.

Silicon Valley D-Lab analysis

Mr. Hiro Saijo
Yamaha Motor Ventures & Laboratory Silicon Valley Inc. CEO

“From user value perspective, differentiation is possible by creating optimal hardware for a particular alternative mean.”

5

Success examples (parts manufacturers, etc.)

5. Small manufacturing firms taking on challenges in U.S. (A)

HILLTOP Technology Laboratory, Inc.
~Prototype processing which drastically improves development speed~

Company name: HILLTOP Technology Laboratory, Inc.
Founded: Sep. 1980
Capital amount: JPY36 million
Number of employees: 15

○ Conventional business（Japan）

Founded in 1961. Develops "HILLTOP SYSTEM" (multiproduct single-item unmanned processing system) on its own. Manufactures an average of 3,000 aluminum and other cut parts per month. Offers quick turnaround (5 days for new orders, 3 days for repeat orders) service to aerospace, auto, medical, film/music, and other industries, providing prototypes and single-item components.

○New business（U.S. “5 Days Prototype Machining”）

Opens business based in Irvine, CA in April 2014. In about 2.5 years, its business expands to roughly 300 business partners, ranging from large to small firms including Disney, NASA, Lucid Motors, Cleveland Golf, UBER, and others. Opens Silicon Valley and Santa Clara offices in 2016.

○What motivated new business in U.S.

The desire to "contribute to front-line develoment under the blue skies of California" was the motivation. It is one of the world's leading areas for development, and has a big, attractive market with its GDP ranking 6th in the world (compared to country GDPs). The infrastructure necessary for speedy service is in place, and people from different ethnic groups gather from all over the world, making it comfortable for the Japanese to make a living as well. The time difference is acceptable, and easy to engage in collaborative work with Japan. All these factors led to realizing this as an opportunity.

○Hardships encountered, words of advice（production method in U.S.）

Our basic policy is “routine work to be done by machines and systems, creative work to be done by people.” We‘ve completely virtualized our processing site, completely separated the factory and office, and enabled 24-hour unmanned processing. Programming is done in the Japan office (midnight hours in U.S.) so the processing can begin the next morning in U.S. factory. One does not have to be a trained technician to participate in the production. Locally hiring both arts and science backgrounds.

○Specific marketing methods, actions

Gained customers by participating in exhibitions. Focused on "Simple, easy-to-remember" brand image. Specifically, ① Emphasized pink on booths and brochures, and ② Highlighted the "5-days" speedy turnaround, ③ Specialized in "pprototyping," ④ "Machining" process. Rather than stressing our processing ability, our goal was to present our service contents so the customers would be able to understand them at a glance. It is easier to get a reaction from the visitors, and easier for us at the booth to respond. We are successful in obtaining about 500 prospective customer information per exhibition.

5 Days P M
rototype achining
HILLTOP
TECHNOLOGY LABORATORY, INC.

DG TAKANO
～From gas valves to water-saving nozzles～

Company Name: DG TAKANO Co., Ltd.
Founded: Sep. 2010 in Tokyo
Capital amount: JPY10 million

○ Conventional business

Takano Seiko Company founded in 1961. Metal cutting for industrial gas stove flame regulators. High-quality with only 1 out of 10,000 defects.

○ New business

Development and sales of water-saving nozzle that can cut up to 95% of water flow. It turns water into foam-like water. Our unique tecnology enables changing the amount of foam in the water, to maintain high washing capacity.

○ What motivated new business

Learned of vendors selling a water-saving device (designed to stop water faucets from turning past a certain level) at 10,000 yen. Thought we could increase added value and that we could succeed as well.

○ Hardships encountered, words of advice

The valve didn't sell for 4 years after it was developed, and still didn't sell after receiving the "super monozukuri award." Encounters are important. What proved useful from attending events hosted by various institutions was the fact that they taught us, and also the matchings they performed. Specific solutions are left to the capacity of individuals. It is important to create an atmosphere where exmployees could freely exchange opinions.

○ Specific marketing methods, actions

Installation cost may be recovered in 3 water-saving months. Once finding a partner, we acquired wider sales channel by focusing on restaurants, and also offered consulting services toward various factories, schools, train stations, hotels, hospitals, etc. Preparing to enter into the U.S. and Middle East markets.

5. Small manufacturing firms taking on challenges in U.S. (C)

NOGAMI
～From parts processing business to solutions business～

Company name: Nogamigiken Co., Ltd.
Founded：Jul.1973, Tokyo
Capital amount: JPY10 million
Number of employees: 60

○Conventional business

Founded in 1970. Nogamigiken Co., Ltd possesses ultra-precise grinding technology guaranteeing precision of 0.0005 millimeters in parallelism and perpendicularity. Engaged in manufacturing of cutting tools (commissioned manufacturing), with 95% business dependency on a single firm.

○New business

Nogami develops a high-quality, long-lasting ultra precise stamping die based on its ultra precise grinding technology. It then rolls out its solution engineering business focused on stamping/cutting processing technology. It opens its stamping/cutting processing technology research center in 2014.

○What motivated new business

When considering how to differentiate from other firms and how to establish a business with high added value, the answer was to start a packaged solution business, which consists of engineering and designing modules. Based on marketing results, the solution engineering business will target stamping/cutting business.

○Hardships encountered, words of advice

Even with industry's top-class technology, it goes unnoticed and products do not sell. The words "unknown is same as non-existent" sounded very convincing, and realizes the importance of manufacturing technique and communicatiing technique was 5:5. After putting emphasis on contents marketing, technology consultation requests regarding stamping/cutting from major firms suddenly increase.

○Specific marketing methods, actions

Participation in Int'l Rechargeable Battery Expo "Battery Japan" since 2008. Identified that burrs and contamination produced when stamping electrode material were the cause for battteries to ignite, and that this was an issue for the industry.
Engaging in R&D, develops stamping die for electrode material with minimal burrs and are long-lasting. Business extends from major firms, research facilities, and universities in Japan to those in Germany and U.S., which includes consulting services as well.

Ultra precise stamping die


Research and Development structure

6

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"10 Worst Practices the Japanese Firms in Silicon Valley Fall Prey To"

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■ Mr. Tak Miyata

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http://www.tackle.jp/

Scrum Ventures weekly blog

Sample of posted article: "Three changes that will take place in the auto industry. What's going to happen in an era where the number of cars owned by a household is reduced by half?"

http://scrum.vc/ja/2016/01/27/car-industry-3-point/

■ Mr. Yoshi Endo

Yoshi Endo's blog for considering monodzukuri in Silicon Valley

http://yoshiendo.com

■ Deloitte Tohmatsu Consulting

"Mobility Revolution 2030 Disruption and Creation in the Auto Industry"（Nikkei Business Publications, 2016）

※As of Mar.2017

Thank you for your attention.